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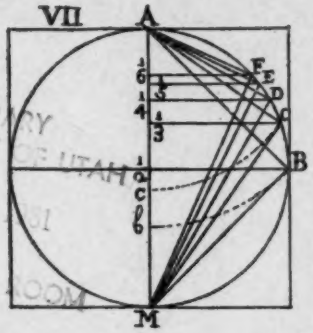

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A Measure of Textural Patterns and Strengths — *Quentin Nordgren*

A Study of the Theories of Giuseppe Tartini — *Alejandro Planchart*

The Professional Music Theorist: A Forum — *David Kraehenbuehl, Norman Phelps, Howard Murphy, Gordon Binkerd, Robert Melcher*

BOOK REVIEWS *THEORY FORUM*

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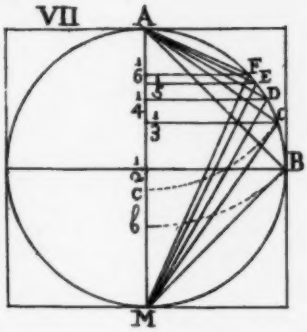

VOLUME IV APRIL 1960 NUMBER 1

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April 1960 VOLUME IV NUMBER 1

JOURNAL OF MUSIC THEORY

ARTICLES		Page
The Science of Harmony: the Harmonic Generation of Chords — Matthew Shirlaw		1
A Measure of Textural Patterns and Strengths — Quentin Nordgren		19
A Study of the Theories of Giuseppe Tartini — Alejandro Planchart		32
The Professional Music Theorist: A Forum		
David Kraehenbuehl		62
Norman Phelps		72
Howard Murphy		75
Gordon Binkerd		77
Robert Melcher		79
THEORY FORUM		
Ernst Oster re: A New Concept of Tonality (?)		85
David Lewin re: The Intervallic Content of a Collection of Notes, Intervallic Relations between a Collection of Notes and its Complement; an Application to Schoenberg's Hexachordal Pieces		98
BOOK REVIEWS	Reviewed by	
Die Reihe (Vol. III)	George Perle	102
Cooke: The Language of Music	Victor Zuckerkandl	104
Andrews: An Introduction to the Technique of Palestrina	H. Leroy Baumgartner	109
Krenek: Modal Counterpoint in the Style of the Sixteenth Century	Francis Judd Cooke	112
Weber: The Rational and Social Foundations of Music	Robert W. Lundin	116
Woodhouse: The Art and Theory of Music	William Pelz	117
Dallin: Listener's Guide to Musical Understanding	Leonard Ratner	119
Other Books not Reviewed		123
Bibliography of Current Periodical Literature		125
Letters to the Editor		128
Contributors to this Issue		129

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THE SCIENCE OF HARMONY:
THE HARMONIC GENERATION OF CHORDS

by

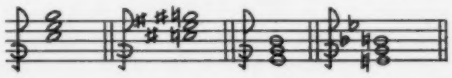
Matthew Shirlaw
Edinburgh, Scotland

If the major as well as the minor harmony consists of a triad of sounds, the simple diatonic key-system consists of a triad of triads. These triads, as individual entities, are of the same tonal significance, the only difference between them being a difference in pitch. Each represents a little tonal system, a species of tonal center. The union of all three triads in a single system, however, brings about a marked change in the tonal character of each. The tonic chord is firmly established as such, while the bright dominant chord and the somewhat somber and plagal subdominant chord acquire their familiar and characteristic tonal or harmonic "color," the result of their new relationship to the central tonic and triad.

It is the influence of the tonic that brings about the sharp quasi-dissonant effect of the third of the dominant triad, the leading-note. The leading-note, it has been frequently stated, defines the tonic. It is not thus, however, that the tonic is determined. Rather, it is the tonic which defines the leading-note. Deprived of the tonic it would have nothing to lead to. The milder, more subdued effect of the subdominant, with its harmony, compared with that of the dominant, arises partly from its plagal origin, and partly because all its sounds are consonant with the tonic. Thus not only each chord in the key-system, but each note of the scale, is endowed with its own distinctive tonal character. The difference in tonal effect of each degree of the scale is not the result of mere difference of pitch, or of the size of the interval that separates one degree from another. Were the key-system dissolved, such tonal significance or color would disappear along with it.

This fact, however familiar to musicians, has not always been sufficiently stressed by writers on harmony. The effect of a chord does not depend solely on its "root," or on the intervals it contains, but very largely on the position it occupies in the key-system. Thus, in Ex. 1, the chord C-E-G is one and the same chord throughout, but there is a

Example 1. A major or B^{b} major



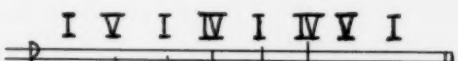
great difference of tonal effect according to the key in which each appears. Wagner can use the triad A-C♯-E like any other composer, for example as tonic triad in A major, but he can entirely change the tonal effect of this chord (Ex. 2). Strictly speaking, however, it is not Wagner who creates, by the mere force of his genius, such an arrest-

ing tonal transformation of the chord A-C♯-E. The effect is largely owing to its peculiar position in the key-system, and neither the chord nor the key-system were created by Wagner. Such a fact of course in no way detracts from Wagner's genius as a master of harmony.

Example 2. Wagner, Tristan and Isolde.

It is, then, as constituent parts of a unified key-system that the dominant and subdominant triads acquire their distinctive harmonic "color." At the same time, they are not entirely deprived of that quality of tonal repose which originally belonged to them. This becomes plainly evident in the cadences I-V and I-IV. In the major key-system the three primary triads are the only triads directly generated from their respective roots. Nevertheless, four other tonal compounds, the so-called secondary triads on the degrees II, III, VI, and VII are generally recognized, even if they have at the outset played no part in the formation of the key-system. Rather, it is to the three primary triads that they owe their existence, for they themselves generate not a single sound of the scale. Thus the meaning and tonal significance of the supertonic D is not primarily that of root of the supertonic triad D-F-A, but fifth of the dominant triad G-B-D. Thus the primary tonal meaning of each degree of the diatonic scale is that of root, third, or fifth of one or another of its three constitutive triads (Ex. 3).

Example 3.

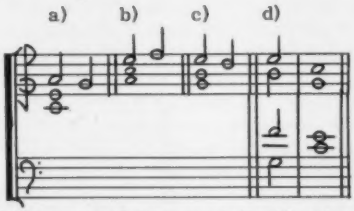


In the submediant triad A-C-E therefore, the third A-C originates as third and fifth of the triad F-A-C, and the third C-E as root and third of the triad C-E-G. The fifth A-E also has its source in both triads. In its origin, then, the submediant triad A-C-E is a duality, a duality which seeks to resolve itself in a harmonic unity, either of the tonic C-E-G, or of the subdominant F-A-C. Thus A tends to give place to G, a fact well known to composers (Ex. 4a). Wagner makes great

play with it in Die Walküre and the "Siegfried Idyll." Again, since the minor A-C arises from the subdominant triad F-A-C, E tends to rise to F and thus complete the subdominant harmony (Ex. 4b). This tendency towards the subdominant is less marked than that towards the tonic, because in the former case it is brought about through the minor third A-C, but in the latter by the major third C-E.

In a similar way the mediant triad E-G-B originates as a duality, the third E-G being derived from the tonic triad C-E-G, and the third G-B from the dominant G-B-D. Here the dominant harmony through its third G-B tends to assert itself, whereupon E is obliged to give way to D (Ex. 4c). So strongly does the mediant triad impress itself on the ear as a duality, that it has been described frequently as a dominant discord, the so-called chord of the 13th which is supposed to result from a series of superadded thirds. So powerfully, however, does the third G-B give to the mediant triad a dominant significance, that in the perfect cadence V-I it may take the place of the dominant triad, or chord of the dominant 7th (Ex. 4d). Again, the third E-G being derived

Example 4.



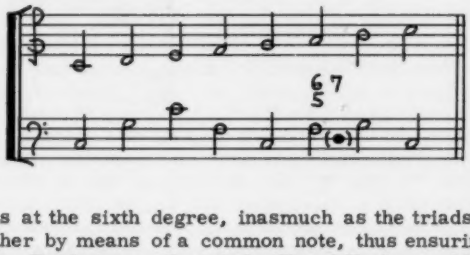
from the tonic triad C-E-G, this may tend to assert itself, whereupon B is obliged to rise to C. E-G, however, is the minor third; hence the urge toward the tonic harmony is not so marked as that toward the dominant.

In the submediant triad A-C-E, A has no other source than as third of the primary triad F-A-C, while C is its fifth. The root of both sounds, which is F, thus presupposed, may actually make its appearance, the result being the chord of the 7th F-A-C-E. The third C-E, however, represents part of the triad C-E-G. This triad may appear in its complete form, resulting in the chord of the 7th A-C-E-G. The chord F-A-C-E has a definitely subdominant character, as if the note E had been added to the subdominant triad. In A-C-E-G on the other hand, the tonic triad predominates. Both triads may appear in their complete form, the result being the chord F-A-C-E-G. A similar situation exists with respect to the mediant triad E-G-B. The third, G, has here a dual significance. It is fifth of the tonic triad C-E-G, but also root of the dominant triad G-B-D. Since the third E-G is derived from the tonic triad, the latter may appear in its complete form, hence, the chord of the 7th C-E-G-B. On the other hand, the dominant triad, of which the third G-B forms part, may appear in its complete form, resulting in the chord of the 7th E-G-B-D. In the first chord the tonic triad predominates; in the second, the dominant. Again, both triads may assume their complete form, resulting in the chord C-E-G-B-D.

There remain two other secondary triads, viz. those on the

supertonic and on the leading-note: in C major, D-F-A and B-D-F. These are quite unlike the submediant and mediant triads. Both are diminished triads, D-F (27:32) being less than a minor third, and D-A (27:40) less than a perfect fifth. In the triad B-D-F the third D-F again finds a place. These triads, which differ so much in character from the submediant and mediant triads, must surely differ also in origin. Nevertheless, both arise from a compounding of two primary triads, viz. dominant and subdominant. But now these are disjunct, whereas formerly the two constitutive triads were conjunct. They represent the two extremes of the key-system. How can these extremes meet? The question is one more easily asked than answered. It is one, however, of the utmost importance in its relation to the science of harmony. It presents a problem on the solution of which depends a proper understanding of the nature and origin of what are known as the fundamental or dominant discords. Amongst the very few writers on harmony who have attempted to deal with this question, Rameau and Hauptmann are the most outstanding. The conclusions at which both arrive, however, present difficulties as great, if not greater, than those they seek to overcome. Rameau, having demonstrated that each note of the scale is derived from one or another of the three primary triads, sets out to harmonize the complete scale with them alone (Ex. 5). This causes him no

Example 5.



trouble until he arrives at the sixth degree, inasmuch as the triads I and IV are linked together by means of a common note, thus ensuring their direct connection. But between the triads IV and V, from which the sounds A and B are respectively derived, there is no link, and no direct connection. To overcome the difficulty Rameau introduced his famous device of double emploi, the double employment of dissonance. That is, he uses for A his chord of the "added sixth," F-A-C-D — of which he has assured us F is the root — and then gives to it the form of the chord of the 7th on the supertonic, D-F-A-C. There is now, he thinks, a real fundamental bass possible for the sixth and seventh degrees of the scale. A properly behaved fundamental bass rises or falls a fourth or fifth, and here D rises a fourth to G. But even if Rameau has at least the merit of perceiving that some explanation here is necessary, his device of double emploi is of no avail. In his chord of the added sixth, D, the dissonant note which has been added above the consonant subdominant harmony, becomes the root of the supertonic 7th chord, D-F-A-C. D, however, is not, and cannot be the root of the third D-F (27:32), of the fifth D-A (27:40), or the seventh D-C. Besides, Rameau set out to prove that each sound of the scale was fitly harmonized by the triad from which it was derived. Quite definitely he shows that this cannot be done. A fourth harmony, that on the super-

tonic, is necessary.

For Moritz Hauptmann, as for Rameau, the scale is harmonically determined; each note of the scale is derived from one of the three triads I, IV, or V. In his attempt, however, to harmonize the scale by means of these three triads, Hauptmann fares even worse than Rameau. Rameau found himself obliged to use four harmonies; Hauptmann requires five. In order to harmonize the 6th, 7th, and 8th degrees of the major scale he uses the two secondary triads III and VI. This device of Hauptmann in order to overcome the difficulty of explaining the immediate or direct harmonic succession of the two dominants, IV and V, is even more astonishing than that of Rameau. Indeed, for Hauptmann, no two disconnected triads can succeed one another directly. A third and mediating chord is required. Chord succession, in his opinion, can be explained only as a linking together of successive harmonies by means of sounds which they possess in common. "The succession of two triads is intelligible only insofar as both can be referred to a common element which changes meaning during the passage."[1] The succession of two disconnected triads, for example, C-E-G to D-F-A, is possible only through the mediation of a third triad, viz. C-E-A, where A furnishes the missing link which enables C-E-A to proceed to D-F-A. Here, however, the actual difficulty is merely avoided. The succession is not from C-E-G to D-F-A, but from A-C-E to D-F-A, quite a different harmonic succession, one indeed that is cadential. According to Hauptmann, then, as well as Rameau — everywhere regarded, and with justice, as two of the most distinguished writers on the science of harmony — there can be no direct succession of the two dominants IV and V.

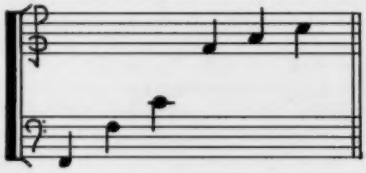
As to this, the majority of musicians will doubtless find themselves in a position similar to that of Galileo, who forced by ecclesiastical threats to make a public abjuration of his belief in the earth's revolution, was unable to conceal his own private opinion ("Still, it moves!"). Indeed, the extremes of the key-system do meet. The two opposed dominants, with their harmonies, may and do succeed one another directly and without the interposition of any other harmony. If no answer be forthcoming as to how this comes about, there is no means, one may repeat, of arriving at an adequate understanding of the origin and nature of what are known as the dominant or fundamental discords.

In the major harmony presented to us in the first six terms of the harmonic series (Ex. 6) F is root or generator of the sounds which appear above it. Each individual term of the series, however, may itself become a tonal center, giving rise to its own series of harmonics which are, in all respects except pitch, the same as in the original series. Were it not so, a modulation from the key of F to the key of C, its fifth, would be impossible. In such a case, C does not become severed from F, which now becomes its subdominant. C then, in setting out to produce its own series, is able to generate its octave. Its

1. "Die Aufeinanderfolge zweier Dreiklänge ist wieder nur insofern verständlich, als beide auf ein gemeinschaftliches, im Uebergange seine Bedeutung verändernde Moment bezogen werden können." Moritz Hauptmann, Die Natur der Harmonik und der Metrik zur Theorie der Musik (Leipzig, 1853), par. 87, p. 66.

first attempts, as one may say, to generate its fifth, G, are not successful; F, the fourth above it, stands in the way. If, however, the vis viva of C has been insufficient to produce its fifth G, and thus to

Example 6.



bring about the harmonic division of the C-octave, viz. C-G-c, there has at least resulted its arithmetical division, C-F-c. In the completed key-system of C, with its three fundamental sounds, F-C-G, F would acquire the function of subdominant — not, however, until then. At present the opposition it presents to the further development of C as generator has the effect of pulling back the arithmetical form C-F-c, to the paternal household, of which it was originally a member, and of which F was prime. The ancient ecclesiastical modes furnish a remarkable illustration of such a tonal development.

In the authentic dorian mode, D, the final, generates only its octave and fifth. The primary basis of the mode, then, was the harmonic division of the octave D-A-d, and this was recognized by musicians of the period. A is the fifth of D, but it is also a potential prime or generator. Like D, it strives to generate its octave and fifth, and thus to bring about a new and independent mode, authentic, and based on the harmonic division of the octave, A-E-a. It succeeds in generating its octave A, but not its fifth E. D, of the dorian system D-A-d-a is already, as it were, in possession. It blocks the way, and must be removed or its opposition overcome, if E, as fifth of A, is to find a place. In the meantime, the arithmetical and plagal form A-D-a is unable to serve as the basis of a new authentic mode. It is pulled back, as it were, into the Dorian, whence it came. It is linked with the Dorian from which it receives its name, the Hypodorian. This explains the somewhat puzzling circumstance that a mode and its hypo-mode had the same final. Thus, although the dorian and hypodorian modes were comprised within quite different octaves, viz. D-d and A-a, D was the final of both.

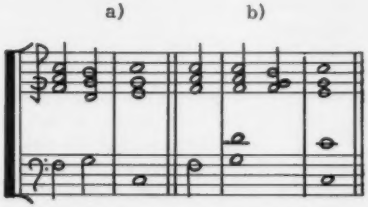
Towards the close of the modal epoch a new authentic mode, with final A, made its appearance, the Aeolian. And now, two distinct types of mode were comprised within the A-octave, one, the Hypodorian, with basis A-D-a, the other, the Aeolian with basis A-E-a. In the latter, A has evidently succeeded finally in producing its fifth, E. Similarly, a new authentic mode with final C was recognized, the Ionian. Two kinds of mode were therefore comprised within the C-octave, the Hypolydian, with basis C-F-c, and the Ionian, with basis C-G-c. These were separate modes, the former representing the arithmetical, the latter the harmonic division of the octave. In our modern key-system both find a place, viz. as C-F-G-c. And thus are determined the three fundamental triads that constitute our key-system.

And here the reader may inquire whence derived its other sounds if the final of the mode generated only its octave and fifth. The answer to these questions is: much in the same way as our major and minor scales, that is by means of the union of similar linked systems — not, however, of harmonic triads, for the modes were formulated when the only harmonic intervals known were those of the octave and fifth. Only much later was the (major) third appreciated as a harmonic interval. The sounds of the modes were derived from the chain of fifths, F-C-G-D-A-E-B. In such a linked series four fifths, each serving as final and fifth of a mode, may be distinguished, viz. G-D, F-C, E-B, D-A. The sounds D, E, F, G form the finals of the four authentic modes. Their fifths, A, B, C, D, are the initials of their allied plagal modes.

Of the three fundamentals which constitute our C key-system, C is manifestly the tonal center. Unlike F and G, it is linked with two fifths, one above, the other below. F generates its octave and fifth, viz. F-C-f. C attempts to do likewise, but its first result is the arithmetical form, C-F-c, in which the fifth finds itself above the fourth, the inversion of the harmonic order, F-C-f. C, however, does not and cannot generate F. To establish itself as a fundamental, it must produce its fifth, G. This it does, in spite of the opposition presented by the fourth, F.

And now it is possible to understand more clearly the origin and nature, not only of the two diminished triads on II and VII, but also the so-called dominant discords. In the following familiar harmonic succession (Ex. 7a) it is apparent that the dominant has overcome the op-

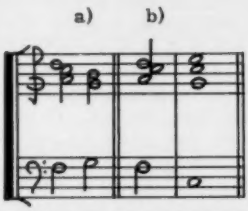
Example 7.



position of the subdominant, F. There is, then, a direct or immediate succession of the opposed dominants, with their harmonies. And this has been effected without the interposition of any mediating chord. The dominant may assert itself even when the subdominant, with its harmony, remains or enters into direct opposition with it (Ex. 7b). It is beside the mark to argue that in such a case the notes of the subdominant harmony are non-harmonic, merely appoggiaturas, or suspensions which delay the real harmony. If F, of the dominant 7th is harmonic, why not also its third, A? In Ex. 7b one finds what is known as the chord of the 11th, a dominant discord, really a dominant-subdominant discord. B, the third of the dominant triad, is usually omitted here, as being in violent opposition or disagreement with C, the fifth of the subdominant triad. When B enters, it is generally as victor in the conflict, and C usually disappears, the result being the chord of the dominant 9th, G-B-D-F-A. With the removal, or disappearance of both C and A, there remains the chord of the dominant 7th G-B-D-F.

In addition, two other chords of the 7th may be distinguished, viz. B-D-F-A and D-F-A-C. The latter, in the position F-A-C-D, takes the form of the much discussed chord of the "added sixth." This, it has been thought, is peculiar in that it proceeds directly not to the dominant but to the tonic harmony. How can this be if the chord arises as the first inversion of the supertonic 7th D-F-A-C? C, the 7th of the chord, ought to resolve on B (Ex. 8a). Instead, it does not resolve at all, but remains stationary (Ex. 8b). D is sometimes explained as a

Example 8.



mere passing-note, presumably non-harmonic. The two chords, however, at (a) and (b) are the same in their origin, and D is no more a passing-note in one than it is in the other, but a real harmonic constituent of the chord. It is the fifth of the dominant, which is evidently bent, as is its wont, on reducing the subdominant and its harmony to a subordinate position. In the form F-A-C-D, however, F finds itself in the bass. Moreover it is supported by all the sounds of its triad. Thus entrenched, it refuses to give way to the harmony of the dominant. Instead, it proceeds directly to that of the tonic, exactly as it does in the plagal cadence.

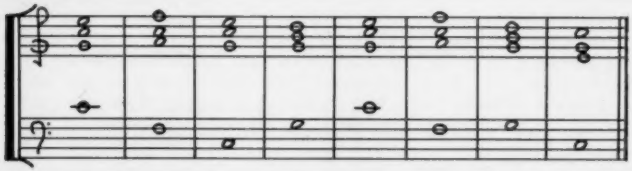
It has been and still is assumed that the dominant is the "root" of all the so-called dominant discords. However, for our harmonic music any and every root generates only its octave, fifth, and (major) third. G is the root of its own major triad; F, the root of the subdominant triad, F-A-C. The dominant does not generate a single sound of the subdominant triad. A so-called chord of the 13th is frequently distinguished, for example, G-F-A-C-E. E, however, is simply part of the subdominant 7th-chord, F-A-C-E, which arises from the two fundamentals F and C, as remarked above. It is the third of C, the tonic, not a 13th, arrived at by means of a long series of superadded thirds. Such a series is quite indefensible. The dominant triad G-B-D certainly does not arise from superadded thirds. And the first third to be added above this triad, viz. D-F, is not a harmonic third at all. Just why it is necessary to include this inharmonic interval (27:32) in such a series, rather than a true minor third, (and why minor instead of major?) has never been explained. Another supposed 13th, viz. G-F-B-E, is simply the mediant triad E-G-B, of marked dominant significance, together with the opposing subdominant, F. In the conflict of the two dominants IV and V, for example G-B-D-F-A-C, the latter triad has secured the ascendancy. In the position F-A-C-G-B-D, with F in the bass, such an ascendancy is much less marked. Finally, the origin and nature of the two diminished triads, B-D-F, and D-F-A, become evident. Both arise with the discord G-B-D-F-A.

The dominant triad may be followed by any other chord, but the

harmony to which it is most nearly related is that of the tonic. As Rameau remarked, in the perfect cadence the fifth returns, as it were, to its source. The dominant-tonic succession is the most direct of all harmonic successions, and brings about the perfect cadence quite independently of any dominant 7th. There is no doubt that the succession V_7 - I provides a useful means for defining a key, a tonic center. The reason is that in such a cadence all the three constitutive fundamentals, as F-C-G, are brought together in a direct succession. It is evident, however, that if there be no key-system, if the key-system has not previously been established, there can be no fundamental triads. It is evident, also, that if there are no fundamental triads, those which actually constitute the key-system, there can be no dominant-7th chord, in the modern sense of the term, that is, one which defines a tonic center.

Somehow, however, the belief became widespread that our key-systems, and the tremendous change from the ancient modes to a new type of harmonic art, were brought about by the introduction of the chord of the dominant 7th, and in general of the unprepared discord, alleged to have been first used by Monteverdi. (In the words of one writer, "Monteverdi is to be revered not only as the greatest musician of his own age, but as the inventor of a system of harmony which has remained in uninterrupted use to the present day!") The key, however, of our modern diatonic and harmonic system may be quite firmly and conclusively established without the use of the dominant 7th, or any other unprepared discord, as is evident from the following passage (Ex. 9), written, not by any 18th- or 19th-century composer, but in a

Example 9.



piece for the virginals by Dr. John Bull, who was born before Monteverdi. For the time being, Dr. Bull does not appear to be much concerned with modal counterpoint. He uses only three triads, the three fundamental triads, in fact, which actually constitute our major key-system. Quite as remarkable is the harmonic lay-out. The half-close on the dominant, and the concluding perfect cadence relate it in form to the opening eight bars of the principal theme in the final movement of Beethoven's Ninth Symphony. The belief in the cataclysmic overthrow of the old modal system, alleged to have been effected by means of the dominant-7th chord, is surely possible only if one becomes entirely oblivious of the course of events during the two centuries that preceded Monteverdi, when the old modes, through musica ficta and the harmonic cadences, slowly began to disappear, and our modern key-systems, quite as slowly and gradually began to emerge. In brief, the chord of the dominant 7th has not created our key-system, nor brought about our modern system of harmony. On the contrary, it

is our key-system, with its three fundamental triads, its authentic and plagal cadences, which created the dominant-7th chord, and endowed it with its tonal and harmonic characteristics.

The three harmonic intervals as they arise in the senario, or primary order of partial tones, and which form the basis of our harmonic music, are the octave the fifth and the (major) third. According to Moritz Hauptmann these intervals are "directly intelligible." They may be so to us, and certainly they arise directly from a prime. For early peoples, however, they were not directly or immediately intelligible. That is, their real harmonic nature or meaning was not at once apparent. All the evidence goes to prove that during the course of many centuries they became, one after another, very gradually appreciated, and that this occurred in the order in which they are generated, viz. first the octave, then the fifth, and last of all the third. It was not until the 13th century that Franco of Cologne gave the third a place among the consonances, with the reservation that it was an imperfect consonance, as if occupying an intermediate position between consonance and dissonance. Quite unjustly, it is still described as imperfect!

Moreover, it is a very remarkable circumstance, and one of considerable importance not only for the science of harmony but also for the history of musical aesthetics, that these intervals were first apprehended in an inverted form, i.e. in an arithmetical rather than a harmonic sense. The Greek octave-systems or modes were descending forms, and each was based on the arithmetical division of the octave, as in the Dorian with basis e-A-E, in which A was regarded as occupying a position of peculiar importance, that of the mese (or middle sound). It is actually the arithmetical mean of the E-octave. Each of the other three modes must have exhibited a similar octave division. This is evident because of the hypo-modes. For it was the arithmetical mean of each mode which determined each hypo-mode, thus:

Modes		Hypo-modes
Dorian	e-A-E	a-E-A
Phrygian	d-G-D	g-D-G
Lydian	c-F-C	f-C-F
Mixolydian	b-E-B	e-B-E

The Greek hypo-mode was actually an inverted mode, in which the fifth represented the inversion of the fourth. That being so, the hypo-form could not have been apprehended by the Greeks as the harmonic division of the octave, nor can it be identified with the later ecclesiastical authentic mode. Nor could the Greek hypo-mode be identified with the later plagal mode. The Greek diatonic octave-systems indeed represent a curious inversion as compared with those of the later modal epoch. Thus the Greek mode became the later hypo-mode, with, however, an important change of tonal meaning, while the Greek hypo-mode was the same in form if not in tonal significance as the later Church authentic mode. Again, while the Greek modes followed a descending order, the ecclesiastical modes succeeded one another in the opposite direction, that is, ascending. As is known, the Greek ethnical names were retained for the Church modes.

The octave and fifth are generated upwards. Why then were they

not appreciated by early peoples in this upward, harmonic sense. Why did the musicians of ancient Greece invert them, turn them upside down? Considerably over 2000 years have elapsed since the classical period of Greek musical activity. Little information is to be gleaned from the sparse writings which have come down to us from this period. Nevertheless, the examination of certain tonal facts, familiar, if not to Greek writers, at least to every musician of the present day, may yield some positive result. One such fact is the harmonic origin and nature of the fifth. Thus the fifth C-G is firmly based on C, its foundation and root. Indeed, the belief is common that there is not, nor can be, any other kind of fifth. And yet for centuries there have been distinguished two different kinds of fifth, one authentic, the other plagal. We distinguish not only a perfect cadence, in which the fifth is authentic, harmonic, but also a plagal cadence, in which the fifth is plagal, arithmetical. So much do these fifths differ in effect, that it seems almost tautological to say that they must differ in their nature.

In the perfect cadence the authentic fifth brings about the harmonic division of the octave. In the plagal cadence the plagal fifth brings about its arithmetical division. Without the octave the nature of the fifth in these respects cannot be determined. With the octave it may appear in its two different aspects. Thus the authentic dorian mode of the Middle Ages, with basis D-A-d, had the same fifth as its concomitant plagal mode, with basis A-D-a, the reverse of the authentic mode. These two aspects of one and the same fifth were determined by its position within the octave. In the authentic form, as found in our key-system of D major, we almost instinctively understand both octave and fifth to have their foundation, their root, in D. In D they are united. The Greeks had not yet learned to appreciate the fifth in this way. Therefore they were unacquainted with the harmonic division of the octave. Nevertheless a tonal relationship of some sort was perceived to exist between its two sounds, and between fifth and octave. What was the nature of this relationship? If, in the harmonic form D-A-d the fact that octave and fifth are united in D was not directly apparent, in the arithmetical form A-D-a it soon becomes evident that both fifth and octave are united in A. And this was the form selected by the Greeks as the basis of their octave-systems. It did not necessarily represent a duality, a form with a double root.

In our key-system of C the octave is divided in both ways. It contains not only the harmonic, but also the arithmetical form C-F-c. Here C appears to generate its octave, and F its fifth. The octave, however, is generated before the fifth; that is, c, appears as octave of C sooner than as fifth of F. In such a case, a double root is unnecessary. For if F does not generate its fifth, c does not thereby disappear. It remains as octave of C. If c be the fifth of F, it becomes subordinate to F. In the key of C this does not happen. C, with its octave, remains as tonic, and the tonic is not subordinate to the subdominant. It is, then, the ascent to the fifth that brings about the arithmetical division of the octave. It arises in the senario, as F-f-c-f'-c'. When the Greeks, added to their octave system A-a that of the fifth, viz. E-e (Ex. 10), they lighted on the basis of their dorian mode, the arithmetical form e-A-E. Of the three fundamentals of our key-system, as F-C-G, not F, but C, is the central tonic. This represents an ascent of the fifth,

and its first result the arithmetical form C-F-c. Not until G has appeared, in overcoming the opposition of F, does there arise also the harmonic form C-G-c. In a modulation from the key of C to that of G, an ascent to the fifth, C has become the subdominant key. C, originally the tonic, has become the subdominant.

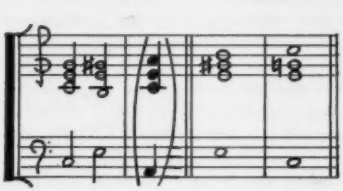
Example 10.

Eventually, the harmonic or authentic fifth became appreciated as such. Even in modern music, however, the fifth readily impresses the ear as an octave sound, as in the first four notes of the opening theme in the final movement of Beethoven's Eroica Symphony which define the arithmetical form B^{b}-E^{b}-B^{b}. Like the authentic fifth, the (harmonic) major third was not directly or immediately appreciated as such. The tonality of the Middle Ages was predominately minor. The sounds of the ecclesiastical modes were derived at the outset from the chain of fifths. Between the sounds of the third, for instance C-E, a certain relationship was perceived. But as fifth-sounds no such relationship existed, and as fifth-sounds they cannot represent the harmonic third. At the outset, then, E has the meaning of fifth of A rather than as third of C. That is, the third C-E, in such a case, is apprehended, not in an upward, harmonic, but in a downward, arithmetical sense. The result is the minor triad A-C-E. Our major and minor modes have taken the place of the ancient authentic and plagal modes. Between these old modes and our major and minor there exists a close analogy. The chief difference is that while in the former the basic intervals were the octave and fifth, in the latter they consist of the octave, fifth, and (major) third. As the ancient plagal mode represents the arithmetical division of the octave, so in a similar way does the minor triad represent the arithmetical division of the fifth. In the former, as E-A-e, E predominated as octave of e. In the latter, as A-C-E, E predominated as fifth of A rather than as third of C. The fifth is generated before the third, and even if C produced no third, E would not thereby disappear. It would remain as fifth of A.

In an upward direction the triad A-C-E is a discord. It contains the "foreign" note, C. The third A-C, however, is not a discord in the major triad F-A-C, for there it arises as the fifth-complement of the major third. Nor is it necessarily a discord in the minor triad A-C-E, for there it also arises as the fifth-complement of the major third — only, however, in a downward direction. The complete major harmony, as C-E-G-c contains all three harmonic intervals, which are united in c. In the complete minor harmony, as E-A-C-e, all three intervals again appear, but in the opposite direction, and all three (octave, fifth, and major third) are united in e. Thus apprehended, it is an organic unity. The arithmetical division of the octave is the primary result of the ascent to the fifth. In like manner the ascent to the (harmonic) third brings about the arithmetical division of the fifth, for example, A-C-E. Such an ascent from F to A would be represented by the two major triads F-A-C and A-C♯-E. A, however, is prevented from generating its natural third, C♯, since C♮ is already in possession and stands in the way. The primary meaning of the ascent to the major third is one that may still be realized by the modern

ear. In Ex. 11, where both triads are major, the primary effect of the second chord on the ear is that of a dominant rather than of a mediant harmony, i.e. dominant of A rather than mediant of C. In the descending direction (Ex. 11b) the triad E-G#-B is more readily appreciated as the third-harmony of C. It is remarkable that both Professors Riemann and Prout refuse to understand it thus, or indeed to recognize any such third-harmonies. For both, it is not a third-but a fifth-harmony, for Riemann a "dominant parallel"; for Prout, a dominant discord (of C major), of which E was the 13th, G# (A^b!) the minor 9th, and B the third of the chord.

Example 11.



Just as there are two species of fifth, so are there two species of (major) third. The authentic fifth cannot be distinguished from the plagal without the octave, expressed or implied. The harmonic third cannot be distinguished from the arithmetical without the fifth. In the modal epoch the fifth F-C of the lydian mode was authentic. In the allied hypo-mode the same fifth became plagal. In the triad C-E-G the third C-E is harmonic. In the triad A-C-E the same third is arithmetical. Although the same third, each species produces a different effect on the ear. While the former is of major, the latter possesses minor meaning, even if it remains a major third.

To recapitulate, in the triad F-A-C not only F, but also A, strives to produce its harmonic sounds. A succeeds in producing its fifth E, but not its third C#; C♮, the second powerful second harmonic of F, blocks the way — thus the triad A-C-E, in which E has precedence as fifth rather than as third. E is the second harmonic sound of A, but the fourth harmonic of C, thus: C-c-g-c'-e'

A-a-e'

The arithmetical principle, although it is actually the harmonic reversed, is nevertheless the necessary corollary and concomitant of the harmonic, for it is the harmonic principle itself which brings it into being. And in the complete minor harmony E-A-C-e the harmonic fifth has become arithmetical.

Evidently the minor harmony has no real fundamental note. A may serve as the root of its fifth, but not of its third, the "foreign" note C. The minor mode, however, cannot dispense with fundamental sounds, just as it cannot be constituted without them. In A minor these are D, A, and E. Each of the minor triads on these sounds contains the "foreign" note, thus practically compelling the ear (which consistently strives to discover the relationship between the sounds of any chord) to understand each triad in a downward direction, as arithmetical. In such a case there can be no convincing perfect cadence. Therefore in the dominant triad E-G-B both third and fifth become harmonic.

G♯ takes the place of G♮. In modal times the third was frequently omitted from the final tonic triad, or the major triad was substituted. In an upward direction, then, the minor triad in the perfect cadence was heard as a discord in music of the modal epoch. Nevertheless the minor harmony in its other aspect as a harmonic unity — this is somewhat remarkable — was freely used, and in its complete form; these can scarcely have been looked upon as discords. In the minor A-C-E the more firmly A is insisted upon as root and fundamental the more discordant does it appear. However, even if the ear is obliged momentarily to accept A as fundamental — at least of its fifth — it is by no means satisfied therewith, or convinced that the chord is harmonic and to be understood in an upward direction. The presence of the "foreign" note C almost compels it to reverse both third and fifth, for the third C-E has no "foreign" note, while the minor third A-C is merely the fifth-complement of the major third.

The reputed fundamental of the minor triad, conscious, one might imagine, of its somewhat precarious position, strives to produce its harmonic (major) third. And it is not always unsuccessful. In the minor mode the triads on both dominant and subdominant may become major — even the tonic triad itself, by means of the Picardy third. Now the difficulties as to fundamentals have been completely overcome. At the same time the minor mode has completely disappeared. The more the minor mode becomes identified with its tonic major, the more does it cease to represent the minor mode. The upper tetrachord in the ascending melodic minor scale is also that of its tonic major. In its descending form, however, it makes amends by restoring the status quo. The minor does not represent, nor does it arise as, a disguised major mode. The chromatic triads on the mediant and submediant of A major (C♯-E-G , and (F♯-A-C) are not arrived at by a process of camouflage. And there is a world of difference — for the ear there is no resemblance — between these chromatic chords in A major, and the same chords, now diatonic, in A minor.

In the abrupt change from the major mode to that of its tonic minor, the first impression made on the ear, truly, is that of a clouded or disguised major mode. It is in vain, however, that such a camouflage attempts to pose as the minor mode. Almost directly the ear rearranges the tonal facts for itself, as it can scarcely help doing, for the three major thirds of the major mode are the same as those of its relative minor. Each third appears in both its aspects: in the major mode, as harmonic; in the minor mode, as arithmetical, thus:

C major: F-A-C-E-G-B-D
A minor: D-F-A-C-E-G-B

Manifestly, the constitutive major thirds of C major are also those of A minor, its relative minor — not, however, of C minor, its tonic minor. There, the thirds in question are E♭-G, A♭-C, and B♭-D. These are not to be found in C major, the tonic major. In C major, E♭, A♭, and B♭ are chromatic notes. In the minor scale, however, all its sounds are diatonic. If the minor is merely an obscured major mode, the three sounds in question become quite arbitrary, without harmonic determination, tonal meaning, or significance. Their correct intonation

would then appear to be merely a matter of taste, since in the minor triad A-C-E the "foreign" note C cannot be determined upwards, but can be intoned accurately only as the fifth-complement of the major third C-E, arising in natural resonance. Hence the difficulty children often experience in their attempts to intone such a third as a camouflaged major third.

The true minor mode is a descending form. In the ascending direction the presence of the "foreign" note in each of its three constitutive triads causes the quasi-fundamental of each to consolidate itself as a real fundamental by producing its major third. When this comes about, however, the minor mode disappears, to give place to its tonic major.

The relationship between the major and minor modes is as the relationship between their fundamental triads. Thus A-C-E is the related or relative minor of the major C-E-G. Both share the same natural (major) third, which, however, appears in both its aspects, the one arithmetical, the other harmonic. The minor triad arises in the harmonic series at the numbers 10, 12, and 15. Where C is prime, the triad is E-G-B. Frequently it has been urged that this is much too high in the series to relate it to, or derive it from, the same harmonic principle -- that of harmonic resonance — which determines the major triad. Few, if any, however, consider C to be the root of the triad E-G-B. This arises, as already stated, in simple fashion, and inevitably as the result of harmonic resonance. In the major triad C-E-G, C produces its primary harmonics. E also, however, strives to do likewise. It succeeds in producing its fifth B, but not its third G♯. G♮ is already in possession; hence, the minor triad E-G-B. It is evident that the two (major and minor) modes are inseparably linked together in a manner which corresponds to the ancient authentic and plagal modes.

In addition to the three fundamental harmonies which constitute the minor mode, there are also the secondary triads on the degrees III and VI. These originate as compounds and dualities, their elements being derived from the three fundamental triads. The mediant triad, as C-E-G (A minor) derives the third C-E from the tonic triad A-C-E, and the third E-G from the dominant E-G-B. The tonic triad may appear in its complete form, hence the chord of the 7th A-C-E-G. Or the fifth of the dominant triad may assert itself, bringing about the chord of the 7th C-E-G-B. The union of both triads has as result A-C-E-G-B. Such a union is not wholly arbitrary. The two triads are linked together by means of the sound E, common to both. In these chords, however, E may generate its major third G♯. The triad on the mediant thereupon becomes C-E-G♯, an augmented triad. Similarly in respect of the submediant triad F-A-C. This, derived from the fundamental triads D-F-A and A-C-E, leads to the two 7th chords: D-F-A-C and F-A-C-E. These chords in A minor differ in tonal meaning from the same chords in C major. But they very readily become identified with them. The chord D-F-A-C-E represents the union of the fundamental triads IV and I. The remaining triads, those on II and VII, arise through the clash of the two opposed dominants, IV and V, with their harmonies. In complete form, this appears as E-G♯ - B -D-F-A, a dominant-subdominant discord, the so-called chord of the 11th. With

G# present, A is generally omitted, and with A present, G# is generally omitted. Thus is formed the triad G#- B- D. This, like the triad B-D-F on the leading-note of C major, is a diminished triad. Actually, both are doubly diminished. Each has not only a fifth less than perfect, but also a third less than minor by the small interval 80:81. The two, however, differ in tonal meaning. Also, while in the latter it is the upper third which is defective, in the former it is the third, B-D. In the dominant discord, as above, there is formed the chord of the dominant 7th E-G# - B-D. In the dominant-7th chord, in minor as in major, the defective third is found between the fifth and seventh of the chord (the term defective here signifies nothing whatever faulty regarding the function this third fulfills, or its position in the key-system); also the chord of the diminished 7th G#-B-D-F and the chord B-D-F-A (not to be identified with the 7th chord on the leading-note of C major); further, the chord of the minor ninth E-G#-B-D-F and the chord of the eleventh referred to above.

In the major key, as constituted by its three fundamental triads, the triads on the mediant and submediant as already mentioned, are compounds or dualities. In C major they arise as follows: F-A-C-E-G-B-D. Determined in such a way, they do not represent harmonic unities, minor triads. This is particularly evident in the case of the mediant triad, as E-G-B. Nevertheless, both mediant and submediant triads are frequently used in the major as harmonic unities, real minor triads, as is confirmed by the judgment of the ear. Moreover, the triad on the supertonic of the major key, for instance D-F-A, also frequently appears as a true minor harmony. This is all the more remarkable since, in the major key system, as constituted by its three fundamental triads, such a triad is not to be found. The triad on the supertonic of the major key is not a minor but a doubly-diminished triad. These three triads, D-F-A, A-C-E, and E-G-B form the linked series D-F-A-C-E-G-B. And such a series represents neither more nor less than the three fundamental harmonies which constitute the key-system of A minor, the relative minor of C major.

It would seem, then, that the appearance of one or more of these minor triads in the major key must signify a departure, for the time being, from that key, and an entrance into that of its relative minor. Not necessarily, however. Over a century ago, Dr. Day observed that the major triad on the supertonic, for instance D-F#-A, does not necessarily signify a change of key. It may represent a chromatic chord in C major or minor. In such a case the ear refers the chord not to G, but to C as tonic center. Actually it arises, in this connection, as dominant triad of G major (not, as Dr. Day imagined, as part of a so-called chord of the 13th on the supertonic). If this be so, it has often been objected, it does not at all sound like it. Nor, indeed, does it. And the reason for such a change of meaning is the change of relationship from G to C as tonic center. The key is still that of C major or minor. Similarly, the appearance in C# major of the triad A-C-E does not necessarily mean that an entrance has been effected into A minor. There is no change of key. The meaning, or tonal effect, however, of the chord undergoes a change, for now it is related to C as tonic center. Unquestionably, C major and G major are individual or separate keys. Here, however, there is represented a stretching-out,

an extension of the key-system, a drawing-within-itself of its dominant key, the evolving of a larger unity.

In the minor key, as in the major, the (major) triads (minor in the major key) on the mediant and submediant originate as dualities. Nevertheless, they may enter the minor as harmonic unities, as real major triads. Even the triad G-B-D, which does not originate with the A-minor system, where the third B-D is less than minor, may find a place in the A-minor mode. These three triads form the connected series F-A-C-E-G-B-D, that is, the triad of triads which constitute the C-major key-system, the relative major. The two keys are individual keys, and it is always possible to modulate from one to the other. Each however, may stretch out to form a larger unity. In such a case, the triad, or it may be the chord of the seventh or ninth, generally undergoes a change in its tonal significance and harmonic "color" as it becomes subservient to the major or the minor tonic. Major and relative minor are, then, interdependent modes which form an extended tonal system or key-complex. There exists, however, another key-complex, more extensive as it is more involved, of which it is possible here only to trace the main outlines.

We have seen that the simple diatonic system is a closed system. In the key-system of C, of which the three fundamental sounds are F-C-G, a harmonic ascent is made to C, resulting in the plagal order C-F-c. A further harmonic ascent is possible from C to G, the result of which is conflict, the clash of the two dominants, the formation of various "dominant discords," and the thrusting back, upon the now firmly established tonic, of the whole mass of harmony represented by such discords. It does not therefore seem possible to make a still further harmonic ascent to the fundamental sound D, the next fifth above G, and include the major triad D-F♯-A as a diatonic triad in the C-major key. It is evident that we have here not one simple diatonic key-system only, but two, viz. F-A-C-E-G-B-D and C-E-G-B-D-F♯-A — that of C and that of G major — and that the triad D-F♯-A belongs to the latter key-system and is derived from it. Nevertheless it may be included, if not as a diatonic triad, certainly as a chromatic triad, as part of the C-major key-system. True, it cannot form part of the simple diatonic key-system. It must therefore form part of some extended key-system. But how can the key-system be extended? There are those who would reply: "why should the key-system be extended?" Chromatic chords — so they imagine — admit of a very simple explanation. They arise through "chromatic alteration" of the diatonic notes. Thus the chromatic supertonic triad, D-F♯-A is derived from the ordinary or diatonic triad D-F-A by raising F a chromatic semitone. Nothing could be more simple or obvious! A serious defect in such an "explanation" is that it explains nothing. It sheds no light on the origin and nature of chromatic chords. Worse still, it leads to conceptions as to the nature of harmony that are entirely erroneous.

The three triads which constitute the diatonic key-system, for example F-A-C-E-G-B-D, are at the outset individual triads, each of which forms an organic unity, complete in itself. These three triads unite, however, thus forming a larger harmonic complex, a larger tonal unity, viz. the key of C major. This is an individual key. But just as its central tonic triad unites with the other two fundamental

triads a fifth higher and lower, so may the complete C-major key-system unite with the keys a fifth higher and lower, viz. G major and F major; for each of the three fundamental triads is a potential tonic center, so that the fundamental sounds F-C-G may represent not only triads but keys. The union of these keys in a still larger harmonic complex, an extended key-system can indeed scarcely be avoided, seeing that the central key shares two of its fundamental triads not only with its dominant but also with its subdominant key. Also the relative minor of each of these three keys cannot be excluded, for the reasons already mentioned. Here, is the extended system of six keys, of which C is the central key:

Major Keys: F-C-G
Minor Keys: D-A-E

The tonic major of each of these three minor keys falls outside such a system. Between a minor key and its tonic major a relationship undoubtedly exists. It is, however, of a peculiar kind. In the minor mode there is a powerful tonal urge towards the tonic major, brought about by natural harmonic resonance. In minor the quasi-fundamental of each of the three constitutive triads strives to produce its major third, and not always unsuccessfully. A certain relationship, then, cannot here be denied. No similar urge exists, however, from the major mode to that of its tonic minor. When such a change does occur, the result, at least at the outset and until the ear has readjusted the tonal facts, is almost invariably not a real minor mode, but a disguised or distorted major one. The former relationship is not thereby destroyed, but it does not appear to operate in the reverse direction.

The chromatic chords which proceed from the key-complex, as described above — C major, and in the opposite direction, A minor — are more numerous than might be expected. To begin with triads only, besides the diatonic dominant triad G-B-D, there arise the chromatic triads G-B^{b}-D, G#-B-D, G-B^{b}-D^{b}, G-B-D#. Not one of these is derived from the diatonic triad G-B-D. The opinion that they thus arise by means of "chromatic alteration" of one or more of the diatonic notes explains nothing, but tends rather to obscure the facts as to their nature and origin. Harmony is not generated by a mere stroke of the pen. The chords in question are all generated by the harmonies of our complex system. In addition, there are various chromatic chords of the seventh, and of the major and minor ninth, of the diminished seventh, etc. In each major mode there is not only a major but also a minor triad on the subdominant, and in each minor mode not only a minor but also a major triad on the dominant. The system also furnishes the chromatic sounds necessary for the complete chromatic scale. The textbooks provide various traditional forms. There is actually, however, no stereotyped form. All depends on the harmonies used for the chromatic notes.

Thus far no mention has been made of harmonic developments since the age of Bach and Handel. The considerations advanced above, however, provide a rational basis for further harmonic research.

A MEASURE OF TEXTURAL PATTERNS AND STRENGTHS

by

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Although in existing writings about music the term texture is not always clearly defined, the term is used to describe phenomena relating to the structure of music. Existing concepts fall generally into two categories: (1) polyphonic or homophonic, and (2) light or heavy. Rimsky-Korsakov points out that harmonic texture is common to both polyphonic and homophonic styles [6, 71]. In this concept the vertical relationship of sounds makes up the texture. Rimsky-Korsakov, as are others interested in orchestration, is concerned with the proper scoring of instruments to avoid too heavy or too light sonorities. Students of orchestration are warned that too many gaps will cause thinness in the harmonic structure [4, 86] and that low scoring of the middle parts will cause heaviness [2, 76, 88].

In the consideration of the total structure of music, the exploration and classification of certain vertical relationships are explained in the study of harmony. Our present-day chord classifications are a great simplification over the classifications existing prior to the time of Rameau, e.g. Johann Mattheson's classification of seventy-four chords into three general groups: consonant, dissonant, and less-used dissonant [8, 16]. Yet, with our classifications, there may be something left unsaid with regard to sonority or the total effect of simultaneously sounded tone-combinations.

It is believed by some theorists that the first inversion of a triad sounds lighter than the same triad in its root position, that harmony in open position usually sounds less intense than in close position, and that large gaps between inner parts produce a weak effect [5, 43-4; 7, 4; 6, 68]. With regard to this, Piston makes the following statement:

> One should listen carefully to the relative effect of various spacings of the same chord and notice the kind of spacing used in music heard. The intervals between voices are an important factor in the texture and actual sound of the music. In the common-practice period of harmonic usage this has been largely a matter of effective distribution of given chord tones, but with the Twentieth Century, composers have become much more preoccupied with intervals and their combinations into individual sonorities [5, 15].

Another phenomenon related to sonority is the register in which the chord or chord-tones is heard. The sound of a given interval or chord in a high or middle register is different from the sound of the same interval or chord in a low register [1, 80; 2, 67-8, 122]. Dyson

maintains that fullness of texture may be achieved by the use of a greater number of instruments [9, 205].

The question arises: Is it possible to measure texture? Hindemith comments on the fact that we do not have anything comparable to a metronome, which measures tempo, or a clock, which measures duration, with which to measure the degree of textural complexity [3, 158]. Irvine asks the question: Why can't we measure the timbre of chords as we do the individual tones of instruments? He believes that a chord should have its own wave-pattern. He maintains that if these patterns could be made visible, a new field of investigation would open up [10, 350-5].

The terms "light" and "heavy" are too general for detailed investigation of the vertical aspects of musical texture. The degree of textural complexity can be better defined and understood. The objective of this study is to set up a workable system for classifying textural patterns and strengths.

Eight aspects of texture are basic to the study of texture. These are as follows: (1) the number of instruments, (2) the range of instruments, (3) the register of the range, (4) the spacing of instruments, (5) the proportion of gap, (6) the register of gap, (7) doubling concentrations, and (8) the register of doubling concentrations. Each of the eight aspects is represented graphically along a continuum of seven degrees. Fig. 1 represents these eight aspects graphically.

NI	1	2	3	4	5	6	7
RI	1	2	3	4	5	6	7
RR	1	2	3	4	5	6	7
SI	1	2	3	4	5	6	7
PG	1	2	3	4	5	6	7
RG	1	2	3	4	5	6	7
DC	1	2	3	4	5	6	7
RC	1	2	3	4	5	6	7

Figure 1. Eight aspects of texture represented graphically.

The number of instruments. It is assumed that a greater number of instruments results in greater textural strength than fewer instruments, and that fewer instruments result in lesser textural strength. The degrees representing the textural strength are as follows: No. 1, two instruments;[1] No. 2, three to five instruments; No. 3, six to eight instruments; No. 4, nine to eleven instruments; No. 5, twelve to fifteen instruments; No. 6, sixteen to nineteen instruments; and No. 7, twenty or more instruments.

Range of instruments. It is assumed that a sonority using a larger range will have a different effect than one using a smaller range.

1. A section playing the same music (such as the first violin section) is counted as one instrument.

If the sonority in each instance has no gaps larger than the other, the textural strength of the larger range will be greater than the one of smaller range. It is upon this basis that the following seven-degree continuum is constructed: No. 1, one octave or less; No. 2, one to two octaves; No. 3, two to three octaves; No. 4, three to four octaves; No. 5, four to five octaves; No. 6, five to six octaves; and No. 7, six or more octaves.

Register of range. It is assumed that the lower the register of a given chord the greater the textural strength; conversely, the higher the register, the less the textural strength. The degrees of register are as follows: No. 1, the 2- to the 4-line octave, inclusive; No. 2, the small to the 2-line octave; No. 3, the contra- to the small octave; No. 4, the 1- to the 4-line octave; No. 5, the contra- to the 1-line octave; No. 6, the great to the 3-line octave; and No. 7, the contra- to the 4-line octave.

Spacing of instruments. It is assumed that the greater amount of space within a given sonority the less the textural strength, and conversely, the less the space, the greater the textural strength. The continuum of seven degrees based on spacing is as follows: No. 1, octaves or fifths (fourths) or both; No. 2, intervals of the third (or sixth) with four or more gaps;[2] No. 3, intervals of the third (or sixth) with two or three gaps; No. 4, intervals of the third (or sixth) with one or no gap; No. 5, intervals of a second (or seventh) with four or more gaps; No. 6, intervals of a second (or seventh) with two or three gaps; and No. 7, includes intervals of a second (or seventh) with one or no gap. In all instances the designated intervals may also include larger, but never smaller, intervals.[3]

Proportion of gap. Associated with spacing of instruments is the proportion of the total gap to the total range. It is assumed that the greater the percentage of gap the less the textural strength, and the less the percentage of gap the greater the textural strength. The degrees of gap-proportion are as follows: No. 1, 91 to 100 percent gap; No. 2, 76 to 90 percent gap; No. 3, 61 to 75 percent gap; No. 4, 46 to 60 percent gap; No. 5, 31 to 45 percent gap; No. 6, 16 to 30 percent gap; and No. 7, 15 percent gap or less.

Register of gap. Associated with the register of instruments and the proportion of gap is the register of gaps. It is assumed that sonorities which have gaps throughout all their registers have less textural strength than those which do not, and conversely.

The low register includes small F and all tones below; the middle register includes all tones from small G to 2-line F; and the high register includes 2-line G and all notes above.

The degrees of the register of gap are as follows: No. 1, high, middle, and low registers; No. 2, middle and low registers; No. 3, high and low registers; No. 4, high and middle registers; No. 5, low register; No. 6, middle register; and No. 7, high register.

2. A gap is defined as a space larger than an interval of a fourth in any chordal structure or group of structures.

3. Degree No. 1 does not include thirds, sixths, seconds, or sevenths. Degrees No. 2, 3, and 4 do not include seconds or sevenths.

Doubling concentrations. It is assumed that chordal structures which have notes doubled, or played by more than one instrument, will tend to increase the textural strength over those which do not.

The degrees of doubling concentrations are as follows: No. 1, single-line doubling; No. 2, octave- or fifth-doubling; No. 3, third-doubling (its inversion or octave-duplicate); No. 4, second-doubling (its inversion or octave-duplicate); No. 5, mixture of most or all of the following — single-, octave-, third-, second-, triad-, and chord-doubling; No. 6, triad-doubling; and No. 7, chord-doubling.

Register of concentrations. With reference to the register of doubling concentrations it is assumed that doubled tones will tend to increase the textural strength more in lower registers than in higher registers.

The degrees of the register of doubling concentrations are as follows: No. 1, high register[4]; No. 2, middle register; No. 3, low register; No. 4, high and middle registers; No. 5, high and low registers; No. 6, middle and low registers; and No. 7, high, middle, and low registers.

It may be noted that one aspect complements another. Where a complete picture is desired each aspect cannot be taken separately; all aspects must be viewed together.

In the analysis and study of musical compositions the following procedure was followed: (1) the grouping together of measures which were structurally homogeneous, (2) the selection of characteristic chordal structures representative of the groups being studied, (3) the reduction of the score to notation representing actual pitch sounds, (4) the transferring of data found on the reduction to the chart illustrating the eight aspects of texture[5] in terms of standards set up, and (5) the gathering of data.

The mechanics of this procedure can be clarified by an example. From Beethoven's Symphony No. 5, measures with structural similarity are illustrated as a group in Ex. 1 (p. 23). Characteristic chord structures are reduced to two staves, the notes of which represent the actual pitches (Ex. 2, p. 24). In light of the standards set up, the data is then transferred to the chart illustrating the eight aspects of texture. This is shown in Fig. 2, p. 24.

It is necessary that the data making up the typical picture of these structures be preserved. However, it is not desirable that every slight deviation be included.

In gathering the data for a movement or work, the following chart was used in connection with the degrees of each aspect:

F = r if mf f vf

Figure 3. Five classifications of frequency.

4. See discussion on registers, pp. 21-2.
5. See chart on p. 20.

Example 1. Measures 48-51 from Beethoven's Symphony No. 5 demonstrating structural similarity.

Example 2. Reduction to characteristic chords.

Numbers indicate number of instruments playing each pitch.

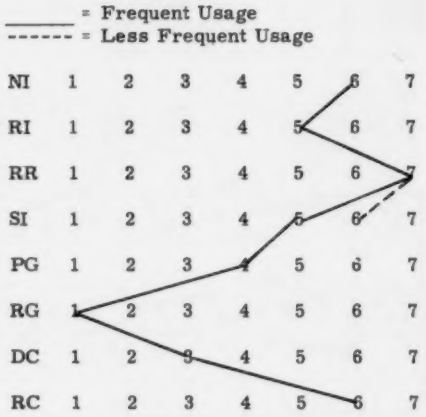

Figure 2. Transferred data.

In Fig. 3, F stands for frequency, r stands for rare, if stands for infrequent, mf stands for medium frequent, f stands for frequent, and vf stands for very frequent. Thus, by using this frequency scale with each of the eight aspects, the various patterns found in a movement or work can be summarized as to the frequency with which each pattern is used.

The average textural strength of any given sonority or group of sonorities may be ascertained by dividing the sum of the appropriate degree number of each aspect by the number of aspects. Using Fig. 2 as an example, we find that, ignoring the less frequent use of SI degree No. 6, the average textural strength of the group of sonorities is 4.63.[6]

In some instances the register of gap will need special consideration when computing average textural strength. As it stands, it is assumed that all three registers are used. However, when only two registers are used, it is necessary to subtract 1 from the degree number, and, when one register is used, it is necessary to subtract 4 from the degree number.

The average textural strength may be found for a movement or work through the extension of the above principle. This is useful in comparing the works of one composer with those of another, with regard to textural strength.

In order to determine the overall textural strength of each aspect in a movement or work, the aspect strength is found. The aspect strength is determined by multiplying each degree with the number representing the frequency-scale rating appropriate to it. The sum of the products of all aspect degrees is then divided by the sum of the frequency-scale numbers used in the multiplication. For example, from the hypothetical data found in Table 1, we find the sum of the products to be 78. We find the sum of the frequency-scale numbers used in the multiplication to be 18. Dividing 78 by 18 we obtain 4.33. Therefore the spacing-of-instruments aspect strength for the second movement is 4.33. The greatest value of the aspect strength is in comparing one movement or work with another, or the works of one composer with those of another.

TABLE 1. SPACING OF INSTRUMENTS RATED ON THE FREQUENCY SCALE (SECOND MOVEMENT)

MOVEMENT	FREQUENCY SCALE RATINGS				
	1.	2.	3.	4.	5.
	r	if	mf	f	vf
Second	6	2	5,7	3	4
	Spacing-of-instruments Degrees				

6. The degrees used add up to a total of 37. This figure divided by the total number of aspects, which is 8, gives an average of 4.625 or 4.63.

QUENTIN R. NORDGREN

Apparent to the observant listener are characteristic differences between the works of such masters as Beethoven and Mendelssohn, or Schumann and Brahms. Some of Brahms' music is said to be "muddy." If this is so, what makes it sound that way? Why does Schumann's music frequently sound "thick" while Mendelssohn's music demonstrates clarity of sound, or why does Beethoven's music reveal power without the "muddiness" of Brahms?

The complete answer to these questions could come only after an exhaustive study of every conceivable phase of the music involved. Nevertheless, a study of its texture is a most important phase.

By using the criteria set up, eight symphonies were analyzed and compared. These symphonies were as follows: Symphonies No. 3 and No. 5 of Beethoven, Symphonies No. 3 and No. 4 of Mendelssohn, Symphonies No. 1 and No. 4 of Schumann, and Symphonies No. 1 and No. 4 of Brahms.

Table 2 (p. 27) illustrates the number of instruments used most frequently by Beethoven, Mendelssohn, Schumann, and Brahms.

The aspect relating to the number of instruments is found to have the least constancy of all aspects. Nevertheless, some combinations are more prominent than others. Found most prominent are Beethoven's use of six to eight instruments, Mendelssohn's use of three to five and nine to eleven instruments, Schumann's use of twelve to fifteen instruments, and Brahms' use of six to eight and twelve to fifteen instruments. Beethoven's number-of-instruments pattern shows a gap between extremes.

Table 3 (p. 27) shows the most frequent use of ranges. The most prominent ranges used by each of the composers are as follows: Beethoven, Mendelssohn, and Schumann, three to four octaves; Brahms, two to three and three to four octaves.

Illustrated in Table 4 (p. 27) are the most frequent patterns of the register of range. The most prominent register used by all four composers is from the great to the 3-line octave.

The most frequent spacing-of-instruments patterns are shown in Table 5 (p. 28). The sonority having intervals of a third or sixth with two or three gaps is found most frequent in all instances with Beethoven and Mendelssohn and is found most prominent with Schumann and Brahms.

The most frequent use of gap-proportions is illustrated in Table 6 (p. 28). The sonority with 61 to 75 percent gap is most prominent with Beethoven, Mendelssohn, and Brahms. The sonority with 46 to 60 percent gap is most prominent with Schumann.

In Table 7 (p. 28) the registers of gap most frequently employed are shown. Gaps in the middle-low register are found to be most frequent in all instances with Mendelssohn and most prominent with Beethoven, Schumann, and Brahms.

The most frequent doubling concentrations are illustrated in Table 8 (p. 29). Single-line and octave-or fifth-doubling concentrations are most prominent with Beethoven. Mendelssohn uses octave-doubling most. Schumann uses octave-doubling most with triad-doubling nearly as much. With Brahms the doubling of the third is most prominent.

Table 9 (p. 29) indicates the registers of doubling concentrations used most frequently. The use of the middle register for doubling con-

TABLE 2. THE NUMBER OF INSTRUMENTS MOST FREQUENTLY USED

Composer	Number of Instruments - Degrees						
	1	2	3	4	5	6	7
Beethoven		2	4			2	1
Mendelssohn		4	2	3	1	2	1
Schumann			2	1	3	1	2
Brahms		1	3	2	3	1	2
	*Times Found Most Frequent						

*This has reference to the number of movements in which certain patterns are found most frequent. Some movements have more than one most frequent pattern.

TABLE 3. RANGES OF INSTRUMENTS MOST FREQUENTLY USED

Composer	Range of Instruments - Degrees						
	1	2	3	4	5	6	7
Beethoven		1	1	7	1		
Mendelssohn			1	8	1		
Schumann			2	7			
Brahms			7	6			
	Times Found Most Frequent						

TABLE 4. REGISTER OF RANGES MOST FREQUENTLY USED

Composer	Register of Range - Degrees						
	1	2	3	4	5	6	7
Beethoven		1				8	1
Mendelssohn						7	2
Schumann					1	8	1
Brahms					1	7	
	Times Found Most Frequent						

TABLE 5. SPACING OF INSTRUMENTS MOST FREQUENTLY USED

Composer	Spacing of Instruments - Degrees						
	1	2	3	4	5	6	7
Beethoven			8				
Mendelssohn			8				
Schumann			7	2			
Brahms			7			2	
	Times Found Most Frequent						

TABLE 6. PROPORTIONS OF GAP MOST FREQUENTLY USED

Composer	Proportion of Gap - Degrees						
	1	2	3	4	5	6	7
Beethoven		2	6	4			
Mendelssohn		1	6	3	1		
Schumann		1	4	6	2		
Brahms			7	1			
	Times Found Most Frequent						

TABLE 7. REGISTERS OF GAP MOST FREQUENTLY USED

Composer	Register of Gap - Degrees						
	1	2	3	4	5	6	7
Beethoven	3	7					
Mendelssohn		8					
Schumann	1	8			1		
Brahms	1	8					
	Times Found Most Frequent						

TABLE 8. DOUBLING CONCENTRATIONS MOST FREQUENTLY USED

Composer	Doubling Concentrations - Degrees						
	1	2	3	4	5	6	7
Beethoven	4	4			1		
Mendelssohn	2	5	1		1	1	
Schumann		4	2			3	
Brahms		2	4		1	2	
	Times Found Most Frequent						

TABLE 9. REGISTER OF CONCENTRATIONS MOST FREQUENTLY USED

Composer	Register of Concentrations - Degrees						
	1	2	3	4	5	6	7
Beethoven		6				3	
Mendelssohn		8					
Schumann		8					
Brahms		8				2	

centrations is found to be most frequent in every instance with Mendelssohn and Schumann and most prominent with Beethoven and Brahms.

The average textural strength of the most frequently used patterns for each of the four composers is as follows: Beethoven, 3.31; Mendelssohn, 3.33; Schumann, 3.65; and Brahms, 3.50.

The average aspect strengths for each composer are shown in Table 10.

TABLE 10. AVERAGE ASPECT STRENGTHS

Composer	Aspect							
	NI	RI	RR	SI	PG	RG	DC	RC
Beethoven	3.97	3.45	4.97	3.74	3.66	2.61	3.33	4.17
Mendelssohn	3.95	3.34	5.10	4.03	3.75	2.58	3.41	3.41
Schumann	4.47	3.32	5.23	3.93	3.69	2.58	3.88	3.61
Brahms	4.26	3.54	4.96	3.97	3.74	2.59	3.56	3.92
	Average Aspect Strength							

There are times when each composer does not use doubling. To what extent each composer uses doubling is indicated by the following approximate percentages: Beethoven, 81 percent; Mendelssohn, 67 percent; Schumann, 93 percent; and Brahms, 76 percent.

This study reveals that four of the aspects were used quite similarly among the four composers. These aspects of texture are: register of range, spacing of instruments, register of gap, and register of doublings. The other four aspects show greater differences.

Schumann and Brahms employ a larger number of instruments with more frequency than do Beethoven and Mendelssohn. Somewhat more surprising is the finding that Brahms uses a narrower sonority range than the other three composers, i.e. with reference to the most frequent patterns. Undoubtedly the impression of a wide sonority range in the music of Brahms comes from the frequent shifting of register, rather than an actual wide sonority range. Found in the music of Schumann was the use of less gap than in the music of the other three composers. In other words, the chords most frequently used were constructed more solidly than the chords of the other composers. The types of doublings used most prominently are Beethoven's single-line and octave-doublings, Mendelssohn's octave-doubling, Schumann's octave- and triad-doublings, and Brahms' third-doubling. As to the amount of doubling employed, the composers arrange themselves in the following order (from those using the principle of doubling most to those using it least): (1) Schumann, (2) Beethoven, (3) Brahms, and (4) Mendelssohn.

Findings which are believed to be most responsible for differences heard in Brahms' music are the following: as compared with the other composers studied, more frequent use of large numbers of instruments (along with Schumann), prominent doubling of the interval of the third, and, to a lesser extent, more frequent doubling in the middle-low register.

TEXTURAL PATTERNS AND STRENGTHS

Characteristic differences in Beethoven's music are due to the following factors: the contrasting use of both few and many instruments (with the few being most frequent), more frequent use of gaps in the high-middle-low register, prominent doublings of the single-line and octave, large percentage of doubling, and, to a lesser extent, doubling in the middle-low register. It is believed that the greatest contributing factor to Beethoven's "lack of muddiness" is the type of doubling used.

The sound of Schumann's music is characteristically different because of the following factors: very frequent use of large numbers of instruments, smaller proportion of gap (more solid construction), prominent doubling of triads, and the large percentage of doubling.

In the works analyzed Mendelssohn was found to be characteristically different because of the following factors: prominent use of a small number of instruments, prominent use of octave-doubling, and a relatively small percentage of doubling.

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A STUDY OF THE THEORIES OF GIUSEPPE TARTINI

by

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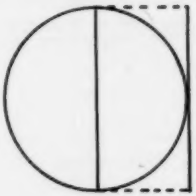
Before beginning a systematic study of the theories of Giuseppe Tartini (1692-1770), it is necessary to examine briefly his position and his goals as a theorist and to give a summary of the contents of the works to be discussed. Of all the theorists of his time no one was more singlemindedly concerned with throwing light upon the most basic principles of harmony; in consequence, anything that in his opinion did not serve this purpose was not brought into consideration [T, cf. letter to Count Decio Agostino Trento, without page number, at the beginning of the book]. Thus we find little or nothing said about practical rules for chord progression or about the structural or affective uses of harmony. To him, the basic principles of harmony are an exact science, derived from nature to be sure, but from a nature rigidly ruled by mathematical proportions in a Cartesian sense. In his work, mathematical relation and proportion take priority, and he derides those who think that the principles of harmony may depend upon feeling or artistry.

He is quite aware of the difficulties into which other theorists have been led in attempting to explain consonant minor harmony and dissonance, and he tries throughout his work to relate the three apparently different foundations of major, minor, and dissonant harmony to an a priori principle which will account for all three. This universal principle, he believes, is to be found in the relationship of the circumference of a circle to its diameter projected as the side of a circumscribed square (Figure 1).

Figure 1.



This leads him to devote much space in his work to long and abstruse mathematical and geometric proofs in which he seeks to demonstrate the validity of this a priori principle and the necessary inclusion of the principles of major, minor, and dissonant harmony in this universal principle to thus produce a complete and closed system.

To most of his contemporaries these proofs were incomprehen-

sible, and those who understood them found errors in Tartini's calculations and attacked his system violently. Even Tartini's follower, Benjamin Stillingfleet says: "One cannot without some impression of compassion, see him wandering in the perplexing labyrinths of abstract ideas, almost without guide, or at best with one which it is most likely would mislead him [G, 16]." And later on: "What I have already said will be sufficient for my not entering into a detail on this long chapter [T, Ch. II] as such a detail would be extremely tedious to some, unintelligible to others and would appear (at least) strange to the only men who are qualified to form any judgement on this matter, I mean the mathematicians [G, 17]." This seems to explain why there has never been an attempt to account fully for this part of Tartini's work, to show where the errors are and in what way they affect his conclusions. Such an attempt is made in this essay.

Tartini's theoretical works are: the Trattato di Musica [T] that appeared in 1754, De' Principj dell'Armonia [P] that appeared in 1767, and a Risposta di G...T...alla crittica del di lui Trattato [R] that appeared in 1767. His other works are two small tracts on ornamentation [A] and violin playing [L]. He has been credited with the authorship of an anonymous Risposta[1] to J. J. Rousseau that appeared in 1769.

This essay is a comparative study of the Trattato, the Principj and the Risposta of 1767; although it would have been desirable to compare these works with the anonymous Risposta, no copy of this work has been available to me.

The Trattato is a long and abtruse work which contains the most comprehensive account of Tartini's theoretical thought. After an introduction, where Tartini exposes the mathematical premises for the demonstrations in the second and third chapters, the work begins with an account of several phenomena which point to the possibility of a physical basis for harmony. Of particular importance here is his account of the difference-tones which are the most secure physical foundation for his system; in the Principj he claims to have discovered this phenomenon in 1714 [P, 36]. In the second and third chapters we find the bulk of his mathematical calculations and geometric proofs; he tries to prove the harmonic nature of the circle and to derive from the relation of the circumference to the diameter the major and minor systems, the diatonic and chromatic dissonances, and even an enharmonic system. The last two chapters are devoted to the derivation of the scale, the establishment of the basic bass progression, and a discussion of several intervals found in the music of his day. The work concludes by answering some possible arguments that could be raised against his system.

The Principj is a much clearer work than the Trattato; the mathematical proofs of the earlier work are for the most part absent here. There is a general re-exposition of the principles of the Trattato, but limited to the diatonic system. The work is divided into four parts. The first deals with the physical foundations of harmony, and contains accounts similar to those in Chapter I of the Trattato. The second

1. Risposta di un anonimo al celebre signor J...J... Rousseau Venice: Antonio Decastro, 1769.

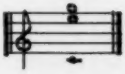
TABLE I
TARTINI'S THIRD SOUNDS

for the fifth:

for the fourth:

for the major third:

for the minor third:



for the major tone:

for the minor tone:

for the major semitone:

for the minor semitone:

deals with the systematic foundation of harmony and is concerned with the derivation of intervals. The third treats what Tartini calls "the musical foundation of harmony" and consists of the derivation of the scale and the establishment of the basic bass progression. The fourth relates the material of the three previous chapters into a unified whole.

The Risposta is a small polemic work in which Tartini answers the objections raised to his Trattato by Jean Adam Serre.[2] It contains very little that has not been dealt with more extensively in the other two books. The most important proposition in the Risposta is a geometric explanation for the formula of the "third sound" (i.e. difference-tones).

Tartini's system is a closely woven one. Unfortunately its author is "quite ignorant of geometry and algebra [R, 5]" and his mistaken calculations lead him astray. He firmly believes that he has found the answer to all the problems of harmonic theory and has discovered a new set of properties for the geometric figures with which his proofs deal. In the Risposta he mentions that he has developed a new science which however he will not yet publish since the few glimpses of it that appeared in the Trattato were so ill-received [R, 10].

The attack on Tartini's system by the French theorists led Fétis to consider Tartini's theories as directly opposed to the theories of Rameau [2, viii, 187]. This is denied by Shirlaw [5, 293]; and it will be evident to anyone who compares the works of the two theorists that, in spite of Tartini's polemic attitude towards Rameau and the attack on Tartini's system by Rameau's followers, the basic theoretical conclusions of both men are quite similar.[3]

In the Trattato, Tartini observes that when a monochord string is plucked, even though it is one string, it produces three distinct sounds: the fundamental, the twelfth, and the seventeenth, which are in the harmonic proportion of 1:1/3:1/5 [T, 10]. Likewise, he notices that when an organ key (with a mixture stop) is pressed many pipes of different pitch sound; but since the sounds produced by the pipes are in harmonic proportion, the aural impression is that of a single sound [T, 12]. From this he deduces that the essence of harmony is unity, a unity that divides itself into multiplicity only to return again to unity as its basic principle [T, 13]. He finds further support for this in the fact that instruments such as the tromba marina produce no sound unless the string is divided into an aliquot part[4] of the total length (unity) of the string [T, 11-12]. In this sense the sounds of the monochord string are "harmonic monads" and the term aliquot parts does not properly describe them [T, 12].

Rameau states that musical sound is not one but three [5, 288].

2. In the Observations sur les principes de l'harmonie, occasionées par quelques écrits modernes sur ce sujet, et particulièrement par... le traité de théorie musicale de M. Tartini... [Geneva: Henri Albert Gosse et Jean Gosse, 1763]. This work was not available to me.

3. There is an excellent account of Rameau's theories by Joan Ferris [8].

4. By an aliquot part of any quantity, line, or surface is meant such a part as will measure the whole without a remainder. That is, an integral divisor.

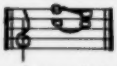
When Tartini states that the three sounds of the monochord string are harmonic monads, he does not place himself in direct opposition to Rameau since he considers multiplicity a function of unity and regards the division of unity into multiplicity and the resolution of multiplicity into unity as parts of a complete cycle [T, 13]. Rameau's emphasis on multiplicity would not contradict directly Tartini's assumption of unity as the basic harmonic principle.

Whether or not multiplicity should be considered beyond the three sounds (1, 1/3, 1/5) which are audibly produced by the monochord string is a matter of extensive discussion in both the Trattato and the Principj. In the conclusion of the Trattato, Tartini admits that other theorists claim to hear the sounds 1/2, 1/4, and even 1/6 in addition to the three sounds he has already reported as being produced by a plucked string. Tartini admits that this may be true but that it would not invalidate his theories since these additional sounds are also in harmonic proportion [T, 170]. He opens the Principj with a discussion of the specific assertions of Rameau [4, 194] and d'Alembert [P, 43ff] with respect to this question. Both claim to have heard the sounds 1/2 and 1/4 produced by a plucked string.

Tartini points out that although they make this claim, they ignore their findings in setting up harmonic systems based solely on 1, 1/3, and 1/5 [P, 3]. He admits that he has been unsuccessful in his attempts to determine the presence of the sounds 1/2 and 1/4 in the vibration of the plucked string because, as octave doublings, they are swallowed up by the fundamental sound of the string [P, 4]. He claims that if Rameau and d'Alembert have indeed heard these sounds, their systems invalidate themselves by not making use of their empirical findings [P, 3].

In his search for a more comprehensive physical foundation for a harmonic system he turns to his discovery of the difference-tones, which he calls the "phenomenon of the third sound [P, 5]."

As reported in the Trattato, he determines their existence through a series of experiments in which two instruments play several intervals. If the intervals are played with just intonation and loud enough, a third sound, generally lower than either of the two sounds being played, will be heard [T, 13-14]. This account is accompanied in the Trattato by a list of the third sounds for the different intervals (Table I, p. 34): for the octave and the unison no third sound is given since Tartini claims that these intervals produce none. The third sounds of an interval and its inversion are the same, sometimes with an octave displacement [T, 14ff].

Any interval will produce a third sound. If two violins play the following:  it will be noticed that the third sound glides from that of one interval to that of the other, never ceasing to sound even though an incommensurable number of intervening intervals have occurred [T, 17]. To him, the third sound is the real physical fundamental bass of any given interval and of any given pair of melodic lines; the successive third sounds produced by their combination constitute the true fundamental bass of the melodies. Any other bass would be absurd or, at best, artificial [T, 17].

Tartini observes that any combination of intervals out of the

senario up to the sounding of the whole senario produces a single third sound, which in the Trattato, he mistakenly identifies as 1/2, that is, an octave above the fundamental [T, 18]. However, in the conclusion of the Trattato he mentions that other theorists have identified the third sound as 1, or the fundamental of the series. This, he says, does not upset his assertion of the third sound as the fundamental bass and physical root of any interval or harmonic series [T, 170-1].

As a consequence of the identification of the third sound of the harmonic series as constant in 1/2, Tartini believes that he has found a novel property of harmonic ratios. Given 1/2:1/3, the resultant (third sound) is 1/2; given 1/3:1/4, the resultant is 1/2 and so on [T, 18-19]. This goes against the basic premise of the system, which considers harmony as a projection of unity. Tartini overlooks this contradiction.

In the Principj, Tartini revises his view and identifies the third sound, still mistakenly, as constant in 1 or in unison with the fundamental of the harmonic series [P, 22]; in addition, he gives a mathematical formula for the deduction of the third sound of any interval. The interval of the fifth, 1/2:1/3, can be expressed arithmetically as 3:2. Tartini asserts that the product of the values that represent the simplest arithmetic expression of an interval will give the correct third sound. In the case of the fifth, 3 x 2 = 6; thus 6 will represent the third sound of the interval 3:2. If 6 is expressed as 1 of the harmonic series, 3 will be 1/2 and 2 will be 1/3 [P, 5-6]. When an interval is expressed in a more complex form, i.e. the octave as 2:4, the product of the terms of the ratio must be divided by the common factor in order to arrive at the correct third sound [P, 6].

This formula enables Tartini to determine the third sounds for the octave and the unison. He explains that they are inaudible because they are in unison with one of the generating tones [P, 5]. Tartini fails to notice that he has invalidated his assertion that the third sound of the senario is constant in 1. The third sound of the octave 1/2:1/4, which is included in the senario, is, by his formula, 1/2.

In the Risposta, trying to defend the Trattato at all costs, he attempts to justify both 1 and 1/2 as third sounds. This is done by means of an involved mathematical proof that attempts to demonstrate that 1/2 is the geometric expression of the third sound, while 1 is the arithmetic one [R, 25ff]. It is important to note that Tartini does not consider the third sound as a foreign element added to the generating interval; the interval, the third sound, and all the harmonic divisions in between, form a harmonic whole [P, 6-7].

The formula for the third sound and the operation it represents are similar to a formula proposed by Leonhard Euler. Euler's formula is based on the multiplication of the terms of the ratio at which two strings vibrate when producing an interval; the product, together with all its integral divisors, will form a complex similar to the harmonic complex of Tartini's system of the third sound [1, 39ff].

Tartini argues that Euler's formula fails to produce a harmonic proportion. The vibration of two strings producing the interval of a fifth are in the ratio 3:2, the product of these terms is 6. The integral divisors of 6 are 3, 2, and 1, and the complex formed by Euler's law is 6:3:2:1, which is not in harmonic proportion. The complex 6:3:2,

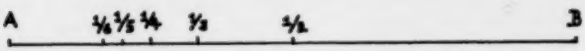
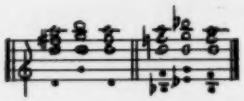
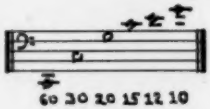


Figure 2.

Example 2.



Example 3.



Example 4.

Example 5.

produced by Tartini's system, is [P, 8-9]. Moreover, in the case of the minor third, 6:5, the complex arrived at by means of Euler's formula is not even consonant, while the one arrived at by Tartini's formula is.

From this, Tartini concludes that the law of the third sound is the law of harmonic proportion and has its basis in unity; in consequence, the ratios contained within the senario should be considered as necessarily basic [P, 9].

To Tartini, the nature of the third sound consists in three properties: first, it is intrinsically physical harmonic unity as a principle; second, it produces harmonic proportion with the generating sounds; third, its simultaneous union with the two generating sounds and all the harmonic divisions in between gives rise to the harmonic system of which the third sound is the fundamental bass [P, 11]. However, the third sound of an interval which has 1 as one of the terms of its ratio cannot produce a proportion with that interval because it will be identical with one of the sounds of the generating interval. In consequence, any interval which has the unit as one of its terms is only potentially harmonic; the third sound will start producing harmonic proportion with the generating sounds from the second interval on in any ordered series [P, 15]. This makes the second interval of any harmonic series the interval that determines the harmonic nature of the series [P, 15].

Within the senario there are only two possible series, one by difference 1 (superparticular) as 1:1/2:1/3 and another by difference 2 (superpartiens) as 1:1/3:1/5. Any attempt to construct a series within the senario using a larger difference will never reach the second interval which is necessary to determine the nature of the series [P, 12].

Returning to the phenomenon of the monochord string, Tartini points out that, while the system of the third sound by difference 1 produces the whole of the senario, the system by difference 2 produces the essence of the senario in 1:1/3:1/5, the sounds that he has heard in the monochord string. The phenomenon of the monochord string is then only a partial one while that of the third sound is the general one [P, 23].

So far, Tartini has worked only with the harmonic division of the string which produces the major system. As soon as he attempts to explain the minor system, trouble arises. In the Trattato he gives the third sounds for the minor triad, which are not one, as in the major triad, but two (Ex. 2). The resultant is a dissonant combination which causes Tartini to comment that, if the third sounds were more audible, only music with major triads would be possible [T, 67].

Minor harmony, derived from the arithmetic division of the string, had been considered by other theorists as "borrowed" from arithmetic science and essentially foreign to harmony. This amounts to an admission of more than one principle for any successful harmonic system, and Tartini finds this assumption absurd and fundamentally opposed to the idea of system itself [T, 68]. Tartini admits the "imperfection" of minor harmony as compared to major — major harmony has "priority of nature" over minor — but he denies that minor harmony may stem from a different principle and considers it as an intrinsically inseparable consequence of major harmony [T, 68].

The argument in both treatises is essentially the same. Given a string of determined length, e.g. 60, he divides the string harmoni-

cally (Fig. 2, p. 38). Each of the segments taken from A to the point of division produces one of the sounds of the series shown in Ex. 3 (p. 38). He calls this series the system of fractions and it is nothing other than the senario.

These divisions, when taken to B, produce another series of string lengths which produce the series of sounds shown in Ex. 4. He calls this the system of advances and considers it the physical proof that minor harmony and the subdominant are an inseparable consequence of major harmony [T, 69; P, 25ff]. He overlooks the fact that the system of advances consists of fractions such as 5/6 which are not aliquot parts of the string and could not be produced by such instruments as the tromba marina.

Rameau relates minor harmony to the co-vibration of multiples of the fundamental string [3, 22].[5] Tartini considers Rameau's point when he superimposes the systems of fractions and of advances upon a constant fundamental sound (Ex. 5). The resultant third sounds (F and A^b in particular) are the same as the sounds of Rameau's sympathetic strings [P, 26-7]. He seems not to notice that great-C is not the fundamental of that series and that the successive third sounds are the fundamentals of each interval. His series, as Shirlaw points out, is actually made of intervals belonging to different harmonic series and at best it proves only that minor harmony is some sort of inverted major harmony [5, 295-6].

Tartini is aware that mere physical proofs are incomplete and sets out to search for a mathematical foundation for his system. However, mathematical principles, in order to be valid, must be evident in the observed physical facts. "Where the point is to establish a system, it is necessary to unite the two categories, physical and mathematical, in such a way that they would be inseparable and form a single principle [T, 20]."

The unity which he believes to have found in the physical foundation of harmony is best expressed by the circle which is in itself one. Each of the infinite number of radii that enter into its construction can serve as unity [T, 21]. This is not enough. The circle must be proven to be a harmonic unity, and to this end Tartini considers it in connection with the straight line represented in the square. In Tartini's opinion, this premise has a definite physical basis. The straight line of the monochord string, when it vibrates to produce the harmonic proportion 1:1/3:1/5, produces some sort of circular figure, and the air masses set in motion by the string take a spheric shape. These

5. Rameau had stated, mistakenly, that a vibrating string will cause to vibrate other strings which are its multiples in length at their respective fundamentals. This would imply a series of "undertones" in inverse proportion to the series of "overtones." Accordingly, a fundamental C would generate F, A^b, C. In the Démonstration [3], Rameau admits that this observation was erroneous; the longer strings vibrate in segments corresponding to the unison of the exciting string. Still, he continues to derive minor harmony from the proportion 6:5:4 and maintains that while major harmony is a direct product of nature, minor harmony is "indicated by nature" [8, 236].

phenomena can be best expressed by the circle which is the most perfect of all curves [T, 21]. The circular line presupposes the existence of a straight line in the radius, which, upon completion of the circumference produces the diameter [T, 21]. The diameter, placed tangent to the circumference, becomes the side of a square which circumscribes the circle (see Fig. 1, p. 32).

From this premise, Tartini attempts to demonstrate the harmonic nature of the circle and to derive from it the basic principles of major, minor, and dissonant harmony, and chromaticism; and to prove that the limit of consonant harmony is to be found in the senario.

Here it is necessary to introduce some of Tartini's arithmetic premises. In the Trattato premesso to the Trattato he states that, given the duple ratio 60:120, the harmonic mean will be 80, the arithmetic mean will be 90, and the counter-harmonic mean will be 100. There is a mean missing, the geometric mean, which Tartini establishes as 84 [T, 1].

The nature of the geometric mean is that the square of the mean is equal to the product of the extremes or that the differences between the extremes and the mean are in the same ratio as the two successive ratios which form the proportion. For example, 2 is the geometric mean between 1 and 4. In consequence, the square of 2 is equal to the product of 1 x 4, and the differences between 1 and 2 and 2 and 4 are in the ratio 1:2 or 2:4, the two ratios that form the proportion 1:2:4.

In Tartini's proportion 120:84:60, this does not hold. This proportion, reduced to its simplest terms is 10:7:5. It is obvious that the differences between the mean and the extremes are not in the same ratio since the mean does not produce the same ratio with both extremes; besides, the square of 7 is 49 while the product of the extremes is 50. Tartini admits this when he says that we cannot have a notion of this mean as geometric because it cannot be expressed by integers but only by a line [T, 1-2][6] Thus he makes a distinction between what he terms the complete irrational geometric mean and the incomplete rational geometric mean [T, 2]. The former would be $\sqrt{50}$ ($5\sqrt{2}$) while the latter is $\sqrt{49}$ (7). Tartini operates with the second one. This is not a valid premise, but Tartini, through this and other such approximations, attempts to warp geometry to suit his system.

Another term which we encounter in Tartini's theory is the discrete geometric proportion. By this Tartini means a proportion in which the product of the harmonic and the arithmetic means is equal to the product of the extremes. In this way, the irrational geometric mean that lies between the harmonic and arithmetic means can be expressed discretely in terms of rational integers. For example, the proportion 12:9:8:6, of which 9 is the arithmetic mean and 8 is the harmonic mean, is a discrete geometric proportion since both 12 x 6 and 9 x 8 equal 72.

Tartini's first goal is to prove the harmonic nature of the circle. Taking the circle AB (Fig. 3, p. 42) with the diameter divided rationally at any point, let us say x, Tartini attempts to show that xy will be the harmonic mean and xz the arithmetic mean of the ratio Ax:xB into

6. The line to which Tartini refers is the diagonal of a square which is always irrational since it involves a length equal to $\sqrt{2}$.

Figure 3.

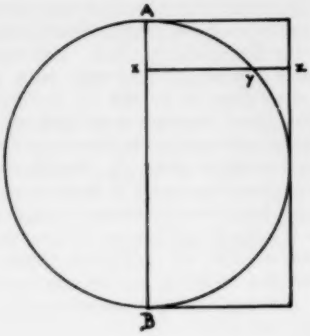


Figure 4.

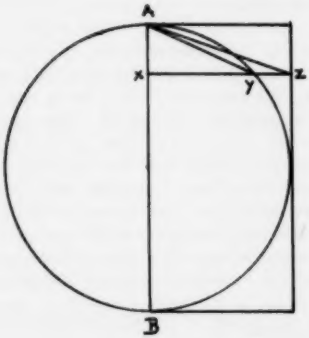
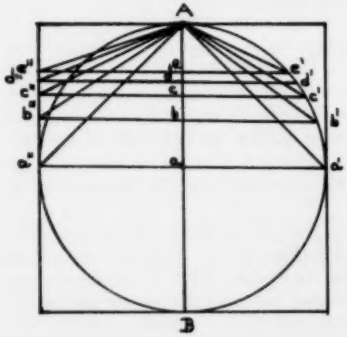


Figure 5.



which the diameter AB is divided.

If, $\overline{Ax}:\overline{xB} = 3:7$

then: $\overline{Ax}^2 = 9$

$\overline{xB}^2 = 49$

$\overline{xy}^2 = 21$ (see footnote 7)

$\overline{xz}^2 = 25$ (because it is r^2).

Expanding the ratio 3:7 (by multiplying by 5) we arrive at the discrete geometric proportion 15:21:25:35, of which 21 is the harmonic mean and 25 the arithmetic mean [T, 22, proposition II]. This seems to indicate that the length of the perpendicular dropped from any point on the diameter to the circumference of a circle is the harmonic mean of the ratio of the line segments into which the diameter is divided by the point on the diameter [T, 39].

Tartini's error in this proof lies in the expression of the discrete geometric proportion of the ratio 3:7. He multiplies all the terms by five except the harmonic mean. If we reduce the discrete geometric proportion to its original form, then 15:21:25:35 becomes $3:\frac{21}{5}:5:7$. However, 21/5 does not represent the segment $\overline{xy}$ which is actually $\sqrt{21}$ for which $2\sqrt{5}$ is a close enough approximation to make the error less evident. Tartini seems to have been vaguely aware that something was out of order in his expression of the ratio 3:7 as the proportion 15:21:25:35 since he attempts to demonstrate, later in the Trattato, that the proportion 15:21:25:35 is a numerical expression for the lengths of the lines in the proportion $\overline{Ax}:\overline{xy}:\overline{xz}:\overline{xB}$ [T, 24].

The second proof of the harmonic nature of the circle is through the same figure with the chord $\overline{Ay}$ and the hypotenuse $\overline{Az}$ added to it (Fig. 4, p. 42).

Given the circle AB, with the diameter divided rationally at x, Tartini says that $\overline{Ay}$ will be the harmonic mean and $\overline{Az}$ the counter-harmonic mean of the ratio $\overline{Ax}:\overline{xz}$.

If, $\overline{Ax}:\overline{xB} = 5:9$

then: $\overline{Ax}^2 = 25$

$\overline{xB}^2 = 81$

$\overline{xy}^2 = 45$

$\overline{xz}^2 = 49$ (because it is r^2)

By the theorem of Pythagoras,[8] $\overline{Ax}^2 + \overline{xy}^2 = \overline{Ay}^2$ (70) and $\overline{xz}^2 + \overline{Ax}^2 = \overline{Az}^2$ (74). $\overline{Ay}^2:\overline{Az}^2 = 70:74$, which, reduced to the simplest terms, is 35:37. If $\overline{Ax}:\overline{xz}$ is expressed as a discrete geometric proportion, we

7. $\overline{xy}$ is the perpendicular dropped from the vertex of the right triangle AyB, hence the square of $\overline{xy}$ is equal to $\overline{Ax}$ times $\overline{xB}$. Substituting 3 for $\overline{Ax}$ and 7 for $\overline{xB}$ we have 3 x 7 = 21 which is the square of $\overline{xy}$.

8. The sum of the squares of the sides of a right triangle is equal to the square of the hypotenuse.

have 30:35:37:42, of which 35 is the harmonic mean and 37 the counter-harmonic mean. This again seems to indicate the harmonic nature of the circle; and further, that the nature of the square seems to be both arithmetic and counter-harmonic [T, 22ff, proposition III].

Again here, as in the previous proof, Tartini's error lies in the expression of his terms as a proportion. If we reduce the proportion 30:35:37:42 to its original form we have 5:35/6:37/6:7. Here the terms 35/6 and 37/6 do not represent the lines $\overline{Ax}$ ($\sqrt{35}$) and $\overline{Az}$ ($\sqrt{37}$) but only approximate them. Tartini never revised his calculations. The Principj contains no calculations of this sort, but in the Risposta, published the same year as the Principj, he states "the circle is an infinite number of harmonic means [R, 14]." This placed him in opposition to all the mathematicians who had demonstrated that the circle is the locus of the geometric mean of the infinite number of ratios into which the diameter can be divided. He is aware of this when he attempts to justify his view by saying that the sine ($\overline{xy}$), as geometric mean, contains both the arithmetic and harmonic means, the arithmetic at the point where the sine touches the diameter, the harmonic at the point where the sine touches the circumference [T, 22ff, proposition IV].

Having arrived at the conclusion that the circle is intrinsically harmonic while the square is intrinsically arithmetic and counter-harmonic, Tartini says that the diameter (arithmetic per se) should be divided harmonically [T, 49]. But from a diameter divided harmonically, the only system that can be derived is that of consonant harmony and as such a particular system. The universal system, Tartini claims, must be derived from the chords, complements, sines, and protracted sines as well, which are derived from the diameter divided harmonically [T, 53].

Theoretically, the diameter can be divided harmonically ad infinitum, but in order to produce a closed system Tartini is forced to find a limit to the divisions of the diameter. As Zarlino does, he sets this limit at the first six divisions of the diameter (the senario) [T, 56-7, proposition VI].

Tartini attempts to prove the necessity of this limit as follows. Given the circle and the square (Fig. 5, p. 42) with the diameter set equal to 120 and divided harmonically through the simplest six divisions, the squares of the chords and of the hypotenuses in the figure (which according to Tartini are the harmonic and counter-harmonic means of the proportions considered in the preceding proof) will be:

$$\overline{Aa'}^2 = 7200,\ \overline{Aa''}^2 = 7200$$

$$\overline{Ab'}^2 = 4800,\ \overline{Ab''}^2 = 5200$$

$$\overline{Ac'}^2 = 3600,\ \overline{Ac''}^2 = 4500$$

$$\overline{Ad'}^2 = 2880,\ \overline{Ad''}^2 = 4176$$

$$\overline{Ae'}^2 = 2400,\ \overline{Ae''}^2 = 4000$$

Omitting the squares of Aa' and of Aa'' since both are the same, Tartini constructs the following proportions using the squares of the remaining segments:

lower extreme	harmonic mean	counter-harmonic mean	upper extreme
4000	$\overline{Ab}'^2$ 4800	$\overline{Ab}''^2$ 5200	6000
2700	$\overline{Ac}'^2$ 3600	$\overline{Ac}''^2$ 4500	5400
2016	$\overline{Ad}'^2$ 2880	$\overline{Ad}''^2$ 4176	5040
1600	$\overline{Ae}'^2$ 2400	$\overline{Ae}''^2$ 4000	4800

The first proportion is a discrete geometric sesquialtera (as 2:3); the second, a discrete geometric duple (as 1:2); the third, a discrete geometric proportion of the ratio 2:5; the last, a discrete geometric triple (as 1:3) [T, 58].

Tartini adds the extremes:

$$4,000 + 6,000 = 10,000$$

$$2,700 + 5,400 = 8,100$$

$$2,016 + 5,040 = 7,056$$

$$1,600 + 4,800 = 6,400$$

and extracts the square root of each total:

$$\sqrt{10,000} = 100$$

$$\sqrt{8,100} = 90$$

$$\sqrt{7,056} = 84$$

$$\sqrt{6,400} = 80$$

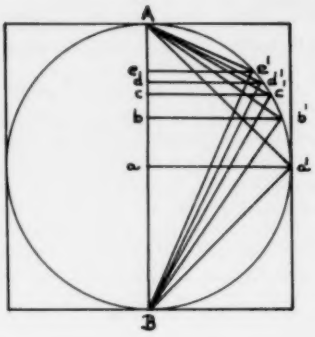
Tartini observes that 100, 90, 84, and 80 are the means of the duple ratio 120:60 (which are the values assigned to the diameter and the radius of the given circle).[9] He has managed to base the entire calculation on a circle with the diameter divided in the basic ratios of the senario and has obtained what he considers a unified expression for all the means of the duple ratio. Tartini regards this as proof that the integral extension and limit of the harmonic system are in the senario [T, 60].

His calculations fail because two of his premises are incorrect. First, the true geometric mean of the ratio 120:60 is not 84 ($\sqrt{7056}$) but $\sqrt{7200}$. Second, the squares of the chords, as we saw in the previous proof, are not the harmonic mean of the ratios produced by the sines and the segments of the diameter that form a right triangle with the sines and the chord.

The limitation of the harmonic system to the senario creates another problem. All accepted consonant intervals are included in the senario except the minor sixth which occurs between 1/5 and 1/8. This exclusion of the minor sixth brought criticism from Serre. In both the Principj and the Risposta, Tartini answers that the minor sixth is incapable of reduction to a harmonic proportion other than the continuous

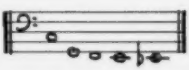
9. As we have seen, Tartini is using the false premise that 84 is a mean of the ratio 120:60, which in fact it is not.

Figure 6.

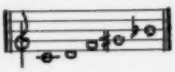


Example 7. a)

b)



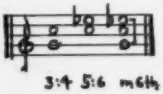
c)



Example 8.

harmonic proportion 1/5:1/6:1/7:1/8, which requires the use of the non-diatonic seventh aliquot part, an absurdity since the harmonic system is essentially diatonic [P, 46]. However, he adds an attempt to derive the minor sixth from the senario. The harmonic triple, which is composed of an octave and a fifth can be expressed arithmetically as 1:2:3. In this form, the proportion is indivisible, but the octave expressed as 2:4 can be divided arithmetically 2:3:4 and the fifth, expressed as 4:6 can be divided arithmetically as 4:5:6. The smaller ratios of each proportion (3:4 and 5:6), when put one above the other (as musical intervals), form the minor sixth (Ex. 6). To Tartini it is obvious

Example 6.



that an interval produced entirely by arithmetic division cannot be included in the harmonic system [P, 48].

Once Tartini has established the universal principle of his system in the circle, he undertakes the derivation of the system from the relationships contained within the figures of the circle and the square. The basic interval of any system is the octave since it is the first interval of any superparticular series that starts from unity. The octave itself does not form any system since it is only a ratio, and to have a system it is necessary to have a proportion. Because of this, the octave is considered the a priori ratio of the system [T, 24; P, 22]. The second ratio of any system is then the ratio that determines the nature of the system; in the case of the harmonic system, this ratio is the fifth (1/2:1/3). The octave and the fifth are then united in the first harmonic proportion of the system, namely, the triple proportion 1:1/2:1/3 [T, 24].

All this is exemplified, according to Tartini, in the construction of the circle; the radius being unity which, upon completion of the circle, has been doubled in the diameter and (approximately) tripled in the circumference. This produces the arithmetic series 1:2:3, which, inverted, produces the harmonic triple 1:1/2:1/3 [T, 27ff]. In the inversion, the circle then represents harmonic as well as arithmetic unity. Tartini attempts to approximate this proportion through long calculations using Archimedes' measurements of 7 for the radius, 14 for the diameter, and 22 for the circumference. He repeats the calculation two other times, the last time using such values as 1,000,000,000 for the radius, 2,000,000,000 for the diameter, and 6,283,185,307 for the circumference[T, 33ff].

The derivation of the intervals of the senario in the Trattato presents no difficulty since they can be derived from the diameter divided harmonically. In the Principj, where Tartini has avoided proofs concerning the circle, the explanation is more involved. He states that the five intervals of the senario must not be derived from the division of an already existent ratio. He finds the system based on the three sounds (1:1/3:1/5) of the monochord string unsatisfactory since the

basic ratio of the harmonic system, the octave (1:1/2), must be obtained by dividing harmonically the ratio 1:1/3, and the last interval of the senario, the minor third, cannot be obtained unless the fraction 1/7 is included [P, 58ff]. He goes then to the system of the third sound and finds that by the superparticular series all the intervals of the senario can be obtained without deriving any interval from another and that the octave finds its proper place at the beginning of the series [P, 59-60].

The derivation of minor harmony follows in both treatises a similar course which consists in deriving it from the advances produced by the harmonic division of a line (the diameter) as was explained earlier in this essay.

However, in the Trattato, Tartini explains the relation of such a system of division, which is essentially arithmetic, to the circle by his remark that the circle must be considered in conjunction with the square [T, 36] — a projection of the diameter of the circle — which is essentially arithmetic.

In the Trattato, after the explanation of the senario, Tartini gives the following rule: "Of the parts that form the senario: 1, 1/2, 1/3, 1/4, 1/5, 1/6, the terms, 1, 1/2, 1/4, must not be put together [by themselves] although they are contained within the senario."[10] The explanation of the rule is that 1:1/2:1/4 form a continuous geometric proportion and as such they are the potential principle for dissonant harmony [T, 62].

In the Trattato, dissonances are derived from the circle in the following manner:

Given the circle AB with the diameter divided up to the first six divisions and having the sines and the chords drawn (Fig. 6, p. 46), Tartini deduces the systems given below. $\overline{AB}^2$ equals the pitch C.

From the squares of $\overline{AB}$, $\overline{Aa}'$, $\overline{Ab}'$, $\overline{Ac}'$, $\overline{Ad}'$, $\overline{Ae}'$: (See Ex. 7a).

From the squares of $\overline{Ba}'$, $\overline{Bb}'$, $\overline{Bc}'$, $\overline{Bd}'$, $\overline{Be}'$: (See Ex. 7b).

From the squares of $\overline{aa}'$, $\overline{bb}'$, $\overline{cc}'$, $\overline{dd}'$, $\overline{ee}'$: (See Ex. 7c).

Tartini then places the first (Ex. 7a) under the third (Ex. 7c), and under both the successive formations of the senario (Ex. 8). From these Tartini observes that, in the second position, the dissonance of the ninth occurs, formed by the two fifths c-g and g-d' which produce a continuous geometric sesquialtera [T, 73ff]. From the same example, he draws the following law: "Generally, any chord will be dissonant that contains two similar intervals of different species except (more by custom than by reason) the octave."[11] Two fourths, two major thirds, etc. will each produce a continuous geometric proportion and, as such, a dissonant combination.

Tartini's next concern is to determine which interval is the dissonant one when two similar intervals appear in the same chord and he says: "Of two similar intervals of different species, that one will be consonant which intrinsically belongs to the harmonic [major] or arithmetic [minor] system. The dissonant one will be that which does not [belong] and cannot possibly belong to either of the two mentioned

10. Che nelle parti integrali della sestupla armonica, 1, 1/2, 1/3, 1/4, 1/5, 1/6, non si pongano insieme questi tre termini, 1, 1/2, 1/4, benche contenuti nella sestupla [T, 62].

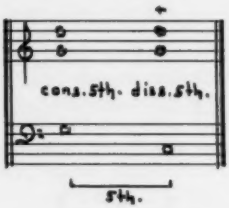
11. Che in genere qualunque accordo musicale sarà dissonante, se si saranno nell'accordo due intervalli simili di specie diversa eccetuata (piu per uso che per ragione) la ottava [T, 74].

systems."[12]

In the same manner, Tartini deals with the remaining notes of Ex. 7c), arriving at the following list of dissonances: ninth, eleventh (fourth), augmented twelfth (augmented fifth), and fourteenth (seventh). Tartini observes that the thirteenth is not present in this system, yet he includes it by definition since it contains two fourths and is therefore dissonant by the law given previously [T, 76]. In the case of the second he concludes that the dissonant note is not the upper note of the interval and this he considers a reason against calling the interval a "dissonance of the second" [T, 77]. He proposes no name for this combination.

Any dissonance, he states, should be prepared by a melodic unison; the dissonant note and the dissonant interval should be prepared by a similar consonant interval, with the bass moving likewise by the same interval [T, 99ff] as in Ex. 9. The resolution of dissonances should proceed downwards by step or half step [T, 82ff]. It

Example 9.



Example 10.

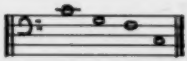
is curious that Tartini even resolves the augmented twelfth in this manner [T, 82 and 130], producing the resolution shown in Ex. 10.

In the Principi, Tartini is concerned with the diatonic dissonances. First he considers the possibility of a system in which the dissonant tones are arrived at from the ratios outside the senario which have odd numbers as denominators; i.e. 1/7, 1/9, 1/11 etc. These are the tones produced naturally by the tromba marina and other similar instruments.

If the first three aliquot parts with odd denominators are added to the senario, we have a system in which the dissonances produced by the ratios with odd numbers as denominators outside the senario would have a consonant basis in the three basic sounds of the monochord string [P, 90]. This would explain the special treatment of the minor seventh (1/7) which is not always prepared, since it stands in this system as some sort of mean between the consonant partials 1:1/3:1/5 and the openly dissonant ones 1/9:1/11:1/13 [P, 90]. This Tartini finds inconclusive since the odd-numbered aliquot parts produce all the out-of-tune tones which cannot be considered diatonic and which are al-

12. ...Che de due intervalli simili di specie diversa sarà il consonante quello che intrinsecamente appartiene al sistema armonico. Sarà il dissonante quello, che in niun modo appartiene, nè può appartenere a'due suddetti sistemi [T, 75].

Example 12.



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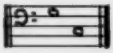

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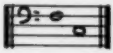
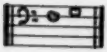
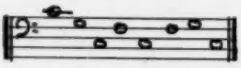


Example 15.



Example 16.



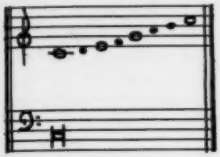
Example 17.

Example 18.

tered by skilled players to fit the diatonic system [P, 95].

He returns again to the system of the third sound and constructs upon the fundamental bass a diatonic scale. Those intervals between the fundamental bass and the notes in the scale which are not included in the senario (Ex. 11) are considered dissonant [P, 88; T, 112]. This results in the same dissonances as the ones derived in the Trattato except for the augmented twelfth which does not appear here since it cannot be considered a diatonic dissonance.

Example 11.



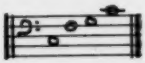
After a discussion of the use of the word "harmony" by Greek theorists, Tartini concludes that since the Greeks did not have simultaneous harmony, their meaning for the word must have been that of successive consonant harmony [T, 143; P, 49ff]. This successive consonant harmony he derives from the basic ratio of the system, the duple, with its harmonic and arithmetic means. This discrete geometric duple can be expressed mathematically as 6:8:9:12 and musically as in Ex. 12 (p. 50). The tones c and c' are the extremes of the duple, g is the harmonic mean, and f the arithmetic mean [P, 70ff].

In the music of his time, successive consonant harmony is represented by the three cadences that can be derived from the duple. The first and more perfect is the harmonic cadence from the harmonic mean to the extreme (Ex. 13). The second and less perfect is the arithmetic cadence from the arithmetic mean to the extreme (Ex. 14). The third and least perfect combines both means and, in so doing, both natures and is called a mixed cadence by Tartini (Ex. 15). By ordering the three cadences according to their degrees of perfection and enclosing them with the extremes of the duple, Tartini arrives at the basic bass progression for the establishment of a key [T, 107; P, 74] (Ex. 16).

From the union of successive and simultaneous harmonies, Tartini derives the scale, which is the basic principle of melody. The union of both harmonies is accomplished through the use of the "organic" formula, which is in turn derived from the senario. The senario as we have seen, can be expressed in its essence in the three sounds of the monochord string, but it may be expressed in yet another way by taking only the three upper tones (Ex. 17). It is from this form of the senario that Tartini derives his "organic" formula: 1, 3, 5 with the 8 added on top as a duplication of the bass-tone [P, 28; T, 101-2]. However, this accounts for major harmony only. Minor harmony is derived from the three lower notes of the arithmetic sextuple [P, 61ff] as in Ex. 18. The union of both major and minor formulae forms a discrete geometric sesquialtera C-G with its harmonic mean E and its arithmetic mean E^b [P, 66ff].

This organic formula can be found in three different positions, and here Tartini recognizes the theory of inversion although the word inversion is never mentioned. The first position is 1, 3, 5, 8; the second, 1, 3, 6; and the third, 1, 4, 6 [T, 105]. Of the three positions,

Example 19.



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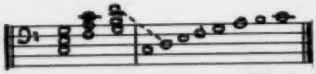
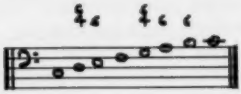


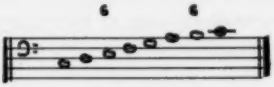
Example 21.

Example 22.



Example 23.

Example 24.



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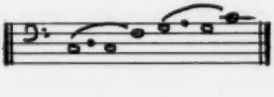

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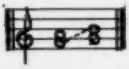


Example 27.

he considers the first the most perfect in most cases. However, he admits that the second position is more important in the minor triad than in the major triad [T, 110-11].

Tartini examines the natural scale produced by such instruments as the tromba marina, horns, trumpets etc. and finds that the ratios from one tone to another are not those used in musical practice. The 4th and 7th notes are "out of tune" [T, 95ff]. This leads to his derivation of the scale, or basic principle of melody, from the union of the two kinds of consonant harmony: simultaneous and successive.

The essence of successive consonant harmony is the discrete geometric duple expressed as in Ex. 19 (p. 52). Since the note C is duplicated, there are only three notes that form the essence of successive consonant harmony: C, F, and G. Upon every one of these three notes a chord is built according to the organic formula, and the three resultant chords are the basis for the formation of the scale [T, 98; P, 71ff] as in Ex. 20. The resultant scale is the Ptolemaic syntonic scale (syntonic ditoniaion) [P, 77].

In the Trattato, Tartini observes that such a scale needs to be tempered since three major thirds will not reach the octave and four minor thirds will exceed it. He is quite distressed by the fact that most temperaments seem to him quite arbitrary; he mentions that Vallotti's temperament[13] is the safest, but offers no solution of his own [T, 100].

The relative minor is derived from the last note of Ex. 7b) (see p. 46) which is $E^{\flat}$, and which Tartini considers to contain inherently both harmonies (major and minor) because, when placed in its proper place as arithmetic mean between C and G, it forms a major third with G and a minor third with C. Thus the distance between the first notes of relative scales is proven to be a minor third [T, 110-11].

Tartini gives three fundamental basses for the scale and consequently three ways of adding figures to the scale when used as bass. However, in both treatises he warns against the confusion of the melody with the successive consonant harmony of the cadences which results in the misuse of the scale as a bass melody [T, 106].

The first fundamental bass for the scale consists in underlining it with the progression of the ordered cadences (Ex. 21). This fundamental bass is completely harmonic in the sense that it is formed totally of major harmonies. The corresponding figuration for the scale would be as shown in Ex. 22 [T, 107].

The second fundamental bass is directly derived from the concept of the discrete geometric duple C, F, G, c. Tartini considers the

13. Tartini refers to the Padre Francescantonio Vallotti (1697-1780) who was organist at the Franciscan seminary in Padua at the time. Vallotti had started writing in 1735 a treatise in four books, Della scienza teorica e practica della moderna musica. However, Vallotti finished only the first book. The other three were written by Vallotti's disciple and successor, Luigi Antonio Sabbatini (1739-1809). The whole work was published as Vallotti's (under the title Trattato della moderna musica) in 1950. In the Libro secondo, Chapter IV, we find Sabbatini's exposition of Vallotti's theories on temperament.

scale as two similar tetrachords and the fundamental bass underlines this factor (Ex. 23). The corresponding figuration is as shown in Ex. 24. This fundamental bass is harmonic in the sense that it consists of two harmonic cadences (Ex. 25), but it underlines, through a strong cadence, the arithmetic mean of the discrete geometric duple C, F, G, c [T, 109ff]. Another characteristic of this bass which distinguishes it from the first is the appearance of minor triads. The minor triads are on D and A, which are presently those tones on which the relative minors of the tones underlined by the two cadences would be based [T, 110].

The third fundamental bass is produced by the observation that, in the first one given, there is a tritone relationship between the harmonies of the sixth and seventh steps (Ex. 26). This relation is considered by Tartini as tolerable when the scale is ascending since it is softened by the passing of the scale from a less perfect mean (arithmetic) to a more perfect one (harmonic). However, when the scale is descending, the relation becomes intolerable since there is nothing to soften it. This is inherent in the harmonic nature which tends to ascend and not to descend [T, 131]. Tartini's solution is quite surprising since here he resorts to the seventh aliquot part which he calls the "consonant seventh" (Ex. 27). This produces a fundamental bass that is a retrograde of itself, or, in Tartini's words, a complete circle [T, 132].

Tartini considers the use of the scale in the bass unwise. The bass motion should be determined by the successive consonant harmony while the realm of the scale is in the upper voices.

The derivation of the chromatic and enharmonic genera is contained entirely within the Trattato. It appears after Tartini gives a brief account of the Greek tetrachords and adds, "I have read all this in Zarlino, a reasonable man and diligent collector of old things. What may have been the reason for dividing the scale in so many tetrachords... I do not know."[14]

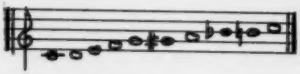
The possibility of interpolating chromatic tones in the diatonic scale in order to provide for melodic chromaticism finds its basic principle in Ex. 7c) (see p. 46), which includes the notes G♯ and B♭ with the help of which the chromatic genus can be constructed [T, 122ff] (see Ex. 28, p. 55).

Through the use of G♯, Tartini arrives at the following chromatic tetrachord (Ex. 29). This tetrachord takes place in A minor, relative minor of C major, which is the tonality produced by the (given) senario [T, 126]. Thus, Tartini relates chromaticism to the minor mode.

To derive the enharmonic tetrachord the seventh aliquot part is interpolated in the scale from a to d' which includes the b♭ (Ex. 30) [T, 127]. Tartini admits that some theorists will complain that this new sound is not prepared and not resolved by descending. To this he answers that the seventh partial, having the same third sound as the first six and being moreover the true harmonic mean of the fourth a-d'

14. Tutto ciò ho letto nel Zarlino, uomo ragionevole, e diligente raccolittore delle cose antiche. Quia sia stata la cagione di divider la scala in tanti Tetracordi... Io non la so [T, 121].

Example 28.



Example 29.

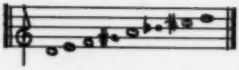
Example 30.

Example 31.

Example 32.

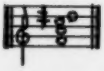
Example 33.

Example 34.

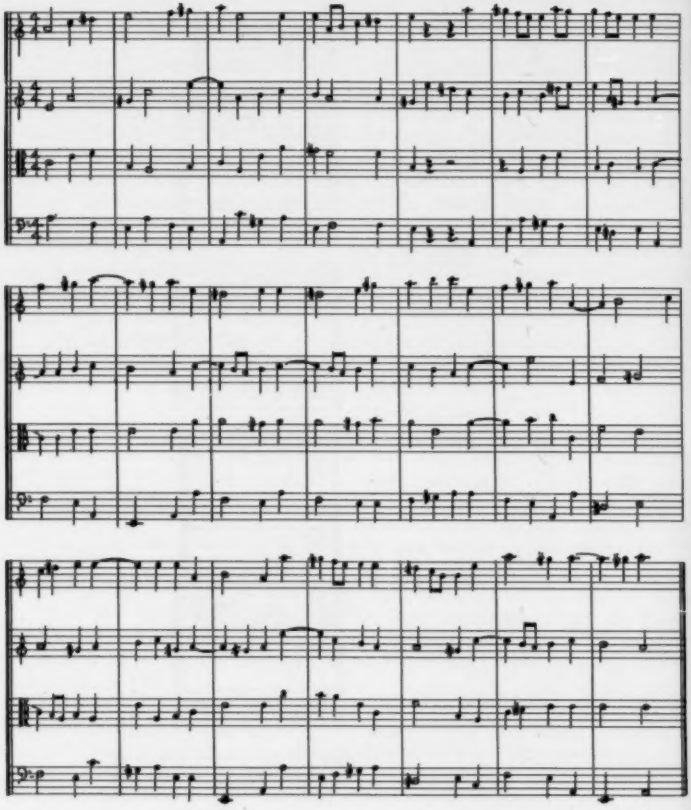


Example 36.

Example 37.



Example 35.



is consonant [T, 128]. He claims that the minor seventh before cadences need not be prepared since the difference between the consonant seventh and the true minor seventh is so small that the minor seventh is thought of as an almost consonant interval [T, 129]. His harmonization of the scale using the seventh partial (Ex. 27, p. 52) belongs therefore to the enharmonic genus.

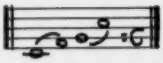
Tartini considers the augmented twelfth a chromatic dissonance, since the G occurs in the chromatic tetrachord, and resolves it as shown in Ex. 10 (p. 49) [T, 130]. The minor seventh, in contrast with the minor fourteenth, which is considered a diatonic dissonance, is regarded as an enharmonic dissonance and given the resolution shown in Ex. 31 [T, 131].

Tartini considers three other intervals and their inversions: the diminished third, inverted as the augmented sixth; the augmented second, inverted as the diminished seventh; and the diminished fourth, inverted as the augmented fifth. All these intervals are derived from the interpolated diatonic scale of Ex. 28 [T, 158]. In accordance with the derivation, Tartini classifies the augmented second and the diminished fourth as chromatic intervals and the diminished third as an enharmonic interval [T, 159]. He states that the diminished seventh is treated as a dissonance although it is not always prepared. The augmented fifth (in contrast to the augmented twelfth) is treated as a non-essential combination since the tone that produces it is not prepared and it ascends (Tartini uses the word discordanza for it) as in Ex. 32. The diminished fourth is treated as a consonance (Ex. 33). The augmented sixth is also treated as a consonance [T, 157-58].

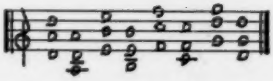
The use of such intervals can be demonstrated in the scale shown in Ex. 34. This scale is based on Ex. 7c) (p. 46). Tartini observes that the scale consists of two equivalent tetrachords, d-a and a-d' and gives an example of a small piece composed using the scale (Ex. 35) [T, 159ff]. Tartini claims that in Ex. 35 the only dissonances are the 4-3 suspensions at the cadences. The only other chord that could be considered dissonant cannot be dissonant in the inversion in which it is written since the D♯ cannot be distinguished, even in the generation of the third sound, from the true harmonic note E^{b-} (Ex. 36). The fundamental for this chord should then be as shown in Ex. 37. Tartini concludes by pointing out the possibilities of such harmonic materials in dramatic music [T, 162ff].

Rhythm and meter, like harmony, are derived by Tartini from the basic ratio of the system, the duple. This ratio provides duple meter. The combination of the duple and the sesquialtera forms the basis for triple meter [T, 114]. In the process of applying meter to the successive consonant harmony and to the melodic voices, rhythm is produced in long and short accents (long and short note-values) which correspond to the long and short syllables of prosody [T, 115]. However, Tartini observes that musical rhythm, particularly in triple meter, is not a strict application of syllabic values to the pitches, but a stylization of the syllabic values which he illustrates as shown in Ex. 38. The first of the two settings is a strict application of the syllable values that results in confused meter, while the second, a stylization

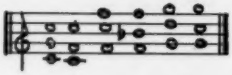
Example 39.



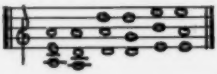
Example 40.



Example 41

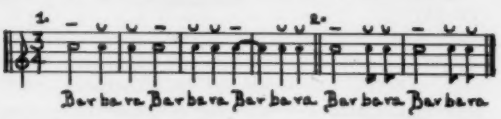


Example 42.



of the syllabic values is clear rhythmically and metrically [T, 139].

Example 38.



Tartini mentions in passing that harmony seems to have a definite influence in determining the long and short accents in music, and he notices the association of downbeats with consonance [T, 117ff].

In the discrete geometric duple, expressed as C, F, G, c, Tartini sees a basis for the three clefs [T, 120] and the basic tonal realm of tonic, dominant, and subdominant [T, 146ff; P, 98ff].

Tartini treats modulation very briefly. A major key, because of its harmonic nature will tend to modulate towards the dominant, a minor key, because of its arithmetic nature will tend to modulate towards the subdominant. Tartini warns against "leaps" in modulation such as going from a key in flats to a key in sharps and requires that the principal key be made clear at the opening and closing of any piece [T, 147ff].

Tartini's notions about history, and about Greek theory, are scattered throughout the two treatises. Greek theory, for him, consists in a statement of the different divisions of the tetrachord [T, 121] and an explanation of the adaptation of the tetrachords to the strings of the kithara [P, 53].

Tartini believed that the Greeks had an octave-species based on the arithmetic and the harmonic divisions of the octave thus forming two tetrachords (Ex. 39). Because of this, he considers his diatonic system as essentially the same as the Greek [P, 49ff; T, 143ff]. Since the Greeks did not have simultaneous harmony, the consonant intervals were the leaps of the fourth, fifth, and octave, while any interval smaller than the fourth was considered dissonant [T, 143].

Tartini considers the ecclesiastical modes as combinations of fourths and fifths. The authentic modes, in which the fifth is at the bottom, he considers as harmonic modes, while the plagal ones with the fourth on the bottom are considered arithmetic modes. However, he finds the organization of the modes unsatisfactory since the harmonic and arithmetic divisions of the octave do not fall within the same octave (Ex. 40). Tartini then proposes what he considers an improved and "natural" organization of the modes based on the harmonic and arithmetic divisions of the octave c-c', f-f', and g-g', which are derived from the discrete geometric duple (Ex. 41). To these six modes, Tartini adds another series of modes based on the arithmetic and harmonic divisions of the octaves A-a, d-d', and e-e' [T, 137] (Ex. 42).

Tartini had little understanding of the organization of the modes and his new modal system is nothing but the major and minor scales that form the common tonal realm of the music of his time.

In the Trattato he uses hexachord nomenclature to refer to any given note; this is dropped in the Principj. However, in the Risposta, published the same year as the Principj, Tartini attacks Serre's use of

the syllable si which, according to Tartini, shows Serre's ignorance of "the masterful Italian solfeggio," that is, hexachord solmisation [R, 70-71].

Tartini's opinions on the affections are found in the fifth chapter of the Trattato. Regarding the affective power of music, Tartini is quite skeptical. He doubts that music, as practiced in his time, can express any precise affection. Greek music could do so since it was monophonic and since particular passions had their own ranges, speed, dynamic qualities, etc. A single voice, with perhaps a single instrument, can most effectively communicate an affection [T, 139ff, 149ff]. Therefore, some of the old Italian dramas which consisted almost entirely of recitative could most clearly communicate an affection [T, 135]. However, in most music of his day which employed many voices this would hardly be possible because the different pitches, motion, etc., of the different voices would obscure any attempt to communicate any given passion clearly. The effect will be a very general one leaning toward one affection or another [T, 141].

The two best means by which to induce an affection in a hearer, Tartini concludes, are melodic ornaments and harmony itself [T, 148-9]. Tartini remarks on the relation of major harmony to fire and joy on one hand, and minor harmony to melancholy, languor, and sweetness on the other. He claims that a harmonic cadence carries the characteristics of the major harmony while an arithmetic cadence has the characteristics of minor harmony. Tartini feels that a study of the affective value of the intervals could begin with this and continue to account for those intervals that are better suited to each voice. He observes that while octaves and fifths sound quite satisfactory in the bass, even if used constantly, they are quite repugnant in the upper voices [T, 153-4]. Such considerations, according to Tartini, would require another treatise written by one who, like the Greeks, would be a musician, philosopher, and poet.

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THE PROFESSIONAL MUSIC THEORIST — HIS HABITS AND TRAINING: A FORUM

The following paper and the panelists' comments which follow it were the substance of a session at the Bienniel Convention of the Music Teachers National Association held in Kansas City in February, 1959. The editorial committee of the Journal of Music Theory is presenting this material in the hope that it will constitute the beginning of a fruitful debate which will center the attention of many interested persons on the question of music theory as a professional pursuit and as a part of the education of professional musicians of all kinds. Our readers are invited to submit their own comments with regard to the points of view presented here. We feel certain that such an exchange of ideas among our readership will be of great benefit to the profession of music theory.

Paper by David Kraehenbuehl, read in the author's absence by Dr. Roy Will.

It is not without reason that we refer to professional theorists here in terms that are usually reserved to the more exceptional creatures of the zoological sciences. A truly professional theorist is indeed a "rare bird," and it is becoming increasingly evident that very few musicians are properly acquainted with his nature. Still fewer understand how he should be trained. This is because he is not often distinguished from his domesticated and more common distant relative, the theory pedagogue, who, as we shall demonstrate later, seldom possesses the identifying features of a true professional theorist.

The average musician has received most of his theoretical training at the hands of a theory pedagogue. The student's usual conception of music theory, then, is precisely that of the theory pedagogue who taught him music theory. He may come to regard music theory as a method of transmitting traditional but no longer vital knowledge of music. He may accept music theory as a form of mental discipline. He is quite certain that music theory includes little more than harmony (beginning, intermediate, and advanced) and counterpoint (strict and free). In reality, music theory may have little or nothing to do with any of these popular conceptions of it; and, if we are to understand the proper work of a professional music theorist, we must first understand the nature of his working area, music theory itself.

The expression "music theory" is compounded of two words about which a surprising amount of confusion exists. It seems best to attack our problem by first making it quite clear what we intend to mean by the terms "music" and "theory."

To begin with, we will regard music as an artistic mode of communication, one of many media by which the experience of one individual — reduced to concepts, ideas, emotional responses, what you will — is transmitted to another individual by means of a formalized

system of signs and symbols. In the creation of a musical composition, the process of abstraction, carried out by the composer, consists in three stages. Beginning with the manifold detail of his personal experience, the composer formulates for himself (perhaps not consciously) various concepts of reality in all its levels of complexity — simple sensation, physical reality, emotional reality, spiritual reality. Whether the composer knows it or not, each level of concept regarding reality is a carefully structured abstraction. Again, consciously or not, the composer seeks to construct out of his medium — that is, out of acoustical phenomena — similarly structured abstractions that will represent for him — and, he believes, for others — his concepts of reality. As a final stage of abstraction, he seeks to represent this imagined acoustical structure in the visual terms which musical notation provides. This notation is very likely to be the least exact account of the composer's initial artistic conception.

The notated music is then taken up by its first and most important listener, the performer, who translates it again into sound, relating it, in so far as he can, to his own conception of reality. Since his conception of reality, together with that of any other listener, will not be identical to that of the composer, a variety of slightly different notions of the "meaning of the music" will develop.

We will take the term "music" to represent this entire process of artistic communication, beginning with the composer's translation of his conception of reality. It is with the process of translation and retranslation that the music theorist should be concerned. He studies the relationship between general reality and musical reality. He devises various tools and techniques by which to demonstrate and describe this relationship in the case of any given composition or group of compositions. Every successful effort on the part of a theorist to describe this relationship will assist all listeners, particularly performers, to a better understanding of the communicative intent of a composition. If a composition by a significant composer is a hint at truth — a reference to unmistakable reality — then it is obviously worth the trouble of all to understand its communicative intent. The theorist of music is only one of the many skilled observers in every field of human endeavor who seek to draw our attention ever more closely to reality, to truth in the most general sense.

If the theorist seeks to demonstrate the processes by which the composer relates general reality and musical reality to create an effective and artistic musical communication, he must devote himself to three different problems. He must understand the process of concept-formation, that is, mankind's technique for organizing the manifold details of experience into useful generalities. He must understand the properties of the acoustical medium in which the composer intends to represent these concepts. He must understand the ways in which acoustical materials may be arranged to represent various concepts of reality.

Now, as a matter of fact, the theorist's present manner of dealing with all these problems has resulted in his almost complete self-abrogation. The humane scientists, particularly the philosophers and psychologists, develop principles of concept formation. The wise music theorist learns to evaluate and make use of the knowledge provided by

these scholars. The natural scientists, specifically the acousticians, develop methods for measuring and describing the nature of acoustical materials. Again, the wise theorist learns to evaluate and make use of the knowledge provided by these specialists. It is specifically the business of the music theorist to discover how creative musicians organize acoustical materials to represent human reasoning and feeling. It is evident that many modern music theorists have not discovered that this is their business. The modern theorist relies largely upon musical tradition to advise him what arrangements of musical materials are effective. The only proof of the merits of any particular arrangement seems to be that, once upon a time, under some set of undetermined conditions, the arrangements in question effectively expressed the creative intention of the moment. The music theorists of today have left the problem of relating extra-musical and musical experience entirely to the ever burgeoning corps of aestheticians who, as theorists, are only surpassed in their lack of professional rigor by the music theorists themselves.

And there it is. There is nothing left for the music theorist to do. For the problems that fall legitimately into his domain, he has accepted as eternal the traditional solutions of the past. But there are still many who call themselves music theorists. What do they do? Finding their proper line of investigation apparently closed and certainly devoid of interest, they become careless acoustical theorists, guileless philosophers, unskilled psychologists, almost anything which they have neither the background nor the rigorous training to be. They are regarded with bitter amusement by both musicians and the legitimate scientists in the fields they have unjustifiably invaded. Unless they come to their senses, they will render the remnant of properly trained professional music theorists suspect and ultimately extinct.

As an aside, I should point out that many musicians feel that a similar unwarranted incursion into their domain has been accomplished by the humane and natural scientists who are seeking to analyze human experience and find the experience of music a useful testing ground. Under the present conditions, this incursion is fully justified. The average psychologist, logician, aesthetician, or acoustician, well-trained in scientific method and descriptive technique, finds himself unable to get a straight or useful answer regarding any theoretical point from most music theorists. He finds the music theory that is recorded in text-books so irrational that it disintegrates under the most casual tests of validity which he applies to his own procedures every day. In many cases, he is given explanations of musical phenomena whose only claim to veracity is their hoary antiquity. Faced with this situation, he should be excused if he goes to the music himself and tries to find out what he needs to know. If music theorists do not soon discover the true nature of their professional responsibilities, music theory will probably be more effectively carried on by persons whose primary interest is not music.

And what is the specific responsibility of the music theorist? His legitimate work area, and it is vast, is the problem of how composers, past and present, succeed in representing the world of concept in the world of sound. His work will require him to describe with meticulous care and illuminating clarity the manner in which musical materials

are organized. He must then demonstrate the relationship between these organizations and the world of non-musical realities. The first step, although useful, is meaningless without the second. He must not only answer the question: "How are the sound materials organized?" but also the question: "Why are they organized in this manner?" or, "To what do the organized sounds refer?" It seems probable that he will never account for the effectiveness of any particular arrangement of sounds in purely musical terms. He must always demonstrate that the musical arrangement is effective only in the degree that it successfully represents some non-musical reality. The theories which he "creates" will answer the general question: "How does the organized pattern of sound represent what it does?" It is in the nature of "theory" that each new body of musical literature, indeed, each significant new composition, will require a revised or altogether new answer to this question.

This brings us directly to the definition of "theory" itself. A popular misconception in our times makes no distinction whatsoever between "theory" and "fact." Musicians are almost universally the victims of this misconception. "Facts" and "the knowledge of facts" cannot be supposed to be identical. That reality is ultimately a complex of facts goes without question. However, our conception of reality, our grasp of reality, remains always tenuous. Knowledge exists for us in four stages of increasing certainty: hypothesis, theory, natural law, and revealed truth. For those who accept the last-named, revealed truths are indeed facts; they constitute specific and sure knowledge of reality. Unfortunately, there are none with regard to music. However, even those who do not accept revealed truths as sensible knowledge, are forced to admit that theories, at their best, represent human knowledge in a relatively uncertain state.

Any thinker begins his approach to reality with an hypothesis, the elements of which he defines with considerable care. He works out the rational implications of his hypothesis in the form of various more elaborate concepts called theories. These theories are usually designed so that they may be tested empirically. If a number of these tests seem to substantiate his theories and their source, his original hypothesis, the theory is considered a workable explanation for some set of observed facts. In problems of the natural world, further substantiation through the centuries may give the theory the status of a natural law. But, even then, there may be reasonable grounds for extensive uncertainty.

To illustrate this, we need only consider the Ptolemaic theory of planetary motion, based, as it was, on an elaborate system of epicycles computed from the utterly false assumption that the earth was the center of the solar system. What is remarkable about this theory (which was considered a natural law and virtually unassailable) is that, although its first premise was false, it provided results for centuries which were substantiated by observation. Ultimately, of course, this so-called natural law began to err. The planets no longer actually occupied the positions predicted by the law. The natural law needed revision if it was to account further for observed reality. Copernicus and others returned to the hypothesis itself, replacing it with the new assumption that the sun was the center of the solar system. Despite

this striking example of the uncertainty of even natural law, persons today assume that the "law of gravity," for example, is fact. It is not. The law of gravity is the currently acceptable principle of attraction which accounts reasonably well for the interactions of free objects in space. Already a number of revisions have been made in this law as a result of the recent observations of theoretical physicists; it may become imperative in the not-too-distant future to cast out our law of gravity altogether in favor of some new and presently unimaginable hypothesis.

Now, if the knowledge of natural scientists is so uncertain, what can we say of the knowledge of music theorists? Music is not part of the natural universe. It is an artifact of mankind. It may, in some philosophical view, be an imitation of nature or an image of the universe, but it remains, at best, an artifice of man, designed to explain nature or the universe to himself. Music lacks even the modicum of constancy that we observe in the universe. It alters its manner of representing reality as frequently as we alter our views of reality. This change of viewpoint occurs demonstrably with each generation. It is, in fact, continuous. Therefore, the music theorist approaches a highly mutable substance with his techniques of description. He invents theories that should be recognized always as tentative, even under the best of circumstances. This does not impair their usefulness, unless, of course, some theorist attempts to apply theories invented to account for one musical situation to some other totally irrelevant situation or, still worse, mistakes a theory for a fact.

As an example of this last mistake in our own time, we might cite the theories of harmony founded on the overtone or partial series. That such a series exists in nature is an observed fact. That it can serve as the basis for a theory of harmony is a debatable hypothesis. It is true that many useful theories of harmony have been developed out of the assumption that harmonic practice derives in some way from the nature of the partial series. Even this does not make this assumption a fact. Only the partial series is a fact; its relevance to harmonic practice is an assumption which is becoming increasingly dubious.

I am acquainted with a theorist who is considering the possibility of replacing this assumption with a totally new one, much as Copernicus replaced the Ptolemaic assumption of an earth-centered solar system. I can well imagine that many would regard the actions of this theorist as presumptuous in the light of the "facts of harmony." By the facts of harmony most persons mean the obvious derivation of harmonic practice from the properties of the partial series. This is an error. The only facts of harmony are that, at various times, various composers put chords one after the other in a certain order. These created chord arrangements of composers are the only facts of harmony. The theory of harmony based on derivations from the partial series is an attempt to explain the actions of these composers, to account logically for their harmonic preferences. That this theory of harmony is unsatisfactory to a high degree is evidenced by the continuing disputes over its veracity. This theorist is merely beginning again with the true facts of harmonic practice — the successions of chords that composers actually used — seeking to explain the reasonableness of these progressions on some basis other than the partial series. To date,

there seems to be a remarkable amount of evidence to substantiate his new assumption. The theory which is developing out of this new hypothesis has the advantages that any new theory should have over an old one: it is more consistent with reality; it is more consistent with itself; its basic premises are less complex but provide explanations for many more complexities in the reality of harmonic practice. This is "creative theory" in the best sense of the word, and it is the creation of theories that is the most important business of the professional music theorist.

We can now see what a professional music theorist must be. He is first and foremost a musician. His knowledge of music, through the first-hand experience of composing and performing music, should be greater than that of any other musician. Secondly, he is a skilled thinker, versed in the techniques of logical demonstration, rational proof, and verbal argument. Thirdly, he is a professional, that is, he spends the major portion of his time thinking about music, searching out the clues which will lead to the development of new and useful theoretical systems. As is always the case, the creation of new things requires thorough knowledge of the old. The professional theorist, then, is also an expert on theoretical systems of the past.

With this summary definition, it becomes evident that a professional theorist is, of course, a rarity. It is also clear that many who might aspire to being professional theorists would fall short in one or another of the requirements set forth. This is understandable. Such persons would still be professional theorists, merely of lesser standing. What is shocking is that most of our so-called "music theorists" fall short in every respect and often by a considerable degree. They are what I would call amateur theorists, if, indeed, they are theorists at all. They are all too often persons who have failed in practical music altogether. Their sole acquaintance with argument is in the form of ill-mannered polemics turning around some trivial point of nomenclature in an already ossified area of theoretical investigation. Their command of the verbal requirements of the English language is superficial. Indeed, I often feel that much of the heat generated in theoretical debates is created by the inability of any of the parties involved to put together one single crystal-clear sentence regarding his or her viewpoint. And, finally, the mere thought of anybody's being so presumptuous as to "create" a theory appals them. Are not "the facts of music theory" virtually God-given? It is almost useless to explain to them that there cannot be any such thing as the "facts of theory."

With the definition of a professional theorist proposed here before us, it is not difficult to determine the nature of his training. To begin with, the professional theorist, like the professional lawyer, doctor, theoretical physicist, is the product of a graduate school. He cannot be anything else. His undergraduate training must include extensive practical experience with music, either as composer or performer, and he must have shown a high degree of skill in his practical work. It is unlikely that a medical school would accept a candidate who had done poorly in chemistry, biology, and bacteriology, although none of these specific skills may be required of a doctor of medicine. Likewise, no graduate school should accept as a theory major a student who has not already demonstrated a high degree of practical musical

skill. The current practice of dumping practical failures into theory programs is reprehensible. If you can't make music, you certainly can't talk about it.

Once the student is definitely aimed at the ultimate goal of becoming a professional theorist, his course work should include, in addition to further practical work in music, serious work in techniques of scientific procedure. How many students of our graduate schools are required to take studies in symbolic logic, methods of psychological research, or related subjects? How many, indeed take any courses in theoretical method, even in music. To come right down to it, how many music schools offer a course in the techniques of theoretical investigation? Yet, such study is essential if the music theorist is to stand in the company of his colleagues in other areas of humane research. Also, with regard to the knowledge of past methods of theoretical investigation, how many schools offer a course in the history of theory where the main stream of theoretical thought through the centuries is laid out systematically? And, finally, how many schools can develop creative theoretical activities? To direct work of this kind, the services of a skilled and enthusiastic creative theorist are essential. The number of such persons is so small that it seems unlikely that more than a handful of schools in the world could be in a position to encourage this last stage in the development of a really fine professional music theorist.

It remains to consider what the professional theorist actually does for the musical world. First of all, he would make an excellent theory pedagogue. But this is the least of his contributions. His main efforts are bent toward the continuing development of theoretical knowledge. He is constantly concerned with the question of musical description. In this capacity, he serves to reduce the area of unavoidable misunderstanding between composer and performer. Precisely because the composer and the performer are distinct individuals, each will have his own view of reality and his own understanding of how musical reality and general reality may be related. Although similar cultural backgrounds may insure that the composer and performer have a lot in common, the composer will generally develop a still more advanced concept of reality than the performer and his techniques of recreating that reality in sound will always be ahead of the performer's experience. The theorist operates as a go-between, an agent, whose function is to keep the performer as close behind the composer as possible. That the modern theorist is not doing this very well is evidenced by the general lack of understanding that the majority of performers bring to music written since 1910.

Through the process of musical description, the creative theorist ultimately arrives at general principles of musical procedure. These are of value both to composer and performer. No composer can make from scratch all the decisions required to create a composition. He needs systematic procedures which will provide a basis for a large proportion of his decisions. The theorist develops these. He generalizes regarding the procedures of previous musical styles and these generalizations serve as the basis upon which the composer makes the less significant decisions in his own style. Most musicians forget that every note in a composition requires a decision by the composer. If

tradition, efficiently summarized in effective theoretical terms, provides the composer with many ready-made decisions, the composer is then freed to expend his creative effort on those decisions that he regards as essential to his specific communicative intentions. In short, he is free to transmit his own personal artistry without rivetting his attention to every single note of the composition as it comes. We neglected to mention what constitutes tradition for a composer. It is the activity of the immediately preceding generation, perhaps even little more than the music of the past few years. I might ask where the young composer of today will find the effective theoretical summaries of recent practice that would help him so much in developing rapidly toward a style of his own? Due to the almost total absence of any creative theory in our time, they barely exist.

This is a tragedy that can be laid directly at the doorstep of the theory pedagogues. I can speak from my own experience which included, I might say, work with some excellent theory pedagogues. I received good training in the traditional substance of species counterpoint, tonal counterpoint, harmony (intermediate and advanced), form and analysis (mostly Mendelssohn and Beethoven), and music literature. During this time, only my piano teacher encouraged me to open any musical book other than the rather tiresome method-books created by various worthies for the courses mentioned. When I finished college, I assumed, indeed, was encouraged to assume, that I had learned theory. That was that. It was a distinct awakening to discover that there was more to theory. I have reason to believe that my experience of some twenty years ago is not radically different from that of the average music student today. It did not occur to me at the time, nor would it occur to one of them, that there might be any such thing as full-time professional work in music theory, an alive and exciting profession that might be said to be younger (because of its long dormancy) than almost any of the new sciences of our century.

To my mind, the recognition of music theory as a real professional activity with the highest professional standards is essential. I do not expect a landslide of enthusiasm for such a notion. Very few persons are in a practical position to be enthusiastic. Nor do I anticipate the realization of such a goal in any less than 30, or perhaps 50, years. The status of music theory is currently too low, the number of really professional music theorists too few, to establish any more than the beginnings of a renaissance of musical theoretical activity with its attendant benefits to musical composition and performance. However, I would like to recommend a few first steps that are reasonable and possible.

My principal recommendation would be to the deans of music schools and the chairmen of music departments. If the staff is to include more than four members, one of these should be a professional theorist, that is, someone whose graduate training was in the field of professional theory as we have described it. I realize that, in many faculties financial conditions require that every faculty member teach a variety of musical subjects. However, I am not sure that this circumstance requires that the faculty consist entirely of instrumental and vocal teachers who also teach some music theory. Could not such a faculty include one professional theorist who takes on some instru-

mental instruction as part of his duty? This would have the advantage that any student really interested in theory would find on the faculty one member who could discuss music theory with him at a somewhat higher level than Kitson and Goetschius. There would be one faculty member who could provide the beginnings of an interest and a skill in theoretical method for a student whose talents seemed to lie in this direction. There would be one faculty member who could demonstrate to the performers the liveliness and usefulness of theoretical knowledge regarding the music of our own century. And, most important of all, we would gradually dissolve a vicious circle which makes each generation of theory teachers the pupils of a previous generation of amateur theorists. No dean would want his professional students in piano to go to their first teaching position without a single minute of instruction from a professional pianist. And yet, many deans send students out to teach theory who have never made the passing acquaintance of a professional theorist.

It is more difficult to make a recommendation regarding the present corps of theory teachers, most of whom are clearly amateur theorists, many of whom would certainly claim to be nothing more. They represent a deeply entrenched vested interest. They must admit both privately and publicly that, whatever it is they teach, it is more in the manner of a musicianship skill than a knowledge of the nature of music. If they understand this and carry out their teaching function with enthusiasm, they can be of great assistance to the majority of musicians. It is when they seek to demonstrate that all discoverable truth about music is contained in their own narrow understanding that they cause dismay among true theorists and discredit the profession of music theory in the eyes of composers and performers alike. We can only ask that they do not make themselves into stumbling-blocks. Theoretical development has already been retarded for two generations by sloth and the firm conviction of many that the theories of the 19th century are the true facts of music, that any departure from them could only be a degradation.

And, finally, a recommendation regarding curricula. With the help of professional theorists, we should begin to examine the emptiness of our current curricula in theory. Is basic musicianship — that is, sight-singing, ear-training, etc. — theory? Of course not. It can be taught as well by any musician as by another. The professional theorists must devise teaching methods that are both efficient and effective, but then these skills can be taught by any of the musicians on the faculty. If these skills must be partitioned off into separate courses, they should be taught as efficiently as possible, perhaps without reference to theoretical principles at all. One does not need to know the theory of scales to play scales at the keyboard. Likewise, one does not need to know the theory of harmony to take down a series of harmonies correctly by dictation. Much too much theoretical claptrap gets thrown at students on the assumption that it will improve their hearing. It rarely does.

Continuing along this line, is species counterpoint an explanation of any actual body of music? Of course not. It was invented by J. J. Fux to teach the control of harmonic progressions in a late baroque style. Why do we use it as the basis for understanding the style of the

Renaissance? It is clearly without any point in the curriculum of the average musician and serves only to convince him of the utter futility of theoretical study.

Is there any point in a performing musician learning to write specific examples of a styleless sort of harmony derived from a melting together of a number of tonal harmonic practices of the past? Of course not. It is equally unimportant that he should learn to imitate, in writing, every mannerism of some very specialized harmonic procedure of the past. The performing musician, and probably the composer as well, would do better to learn the general principles of harmonic motion that underlie all the details of various tonal harmonic styles. He could then observe these forces at work in a great many traditional and modern styles. It is by this procedure that the modern student of physics is freed to spend the major portion of his study time with physics as it has developed in our own century. The past is summed up for him in a few general principles which he can observe in action in a series of carefully selected laboratory experiments. Why not teach harmonic tradition in the same way? Present a few general principles which can then be shown to operate in musical reality. This will free the student to tackle in detail the nature of the music of his own century, the only music that will be of any great significance to him within 20 or 30 years.

Is there some reason why the analysis of musical form should rest largely upon Beethoven? Is no other composer capable of formal intelligence? Why must anyone learn to write a fugue? Is there something of special significance about the fugue that makes it the finest musical communication? Or is it rather that its simple structural procedures are readily teachable, making it possible for the uninspired pedagogue to muddle through with a semblance of self-respect? In short, are our curricula a collection of items that are still somehow teachable whether they are especially significant or not? Do we teach certain items as theory merely because lots of textbooks are available whether their content is relevant to current practice or not?

We could go on and on, raising ever more embarrassing questions regarding the utterly stultified organization and content of our present theory curricula. We should not teach anything merely because it is good discipline. We should not teach anything because it has always been taught. The needs of a culture change and what was once taught may no longer be relevant. How long would public funds be made available to a high-school whose driving course was discovered to be concerned entirely with the problems of driving horses? How long can public and private funds be provided for theory instruction that is similarly antiquated? Our present programs only convince any musician who harbored any doubts about the matter that theoretical study is a thoroughgoing waste of time. At the undergraduate level, certainly, only that which helps the student to a better understanding of musical forces and musical communication, particularly in our own time, should be taught. An increasing and carefully trained corps of professional music theorists would provide the content, the format, and the teachers for a curriculum that would make possible a really effective education in the understanding of music for all competent musicians. And we should not forget that no curriculum is better than the individual

teachers that carry it out. If we are to have effective theory curricula, the teachers in these curricula must be professional music theorists.

Discussion by Norman Phelps

Mr. Kraehenbuehl is very concerned about the status of music theorists as scholars and about the state of music theory as a discipline. These concerns, I believe, are felt by many of us. Few of us, however, are as forthright or as vocal in attempting to bring the problem into focus. We are indebted to Mr. Kraehenbuehl for his attempt to do so.

At the recent Kansas City meeting of MTNA, where his paper was originally read, time would not allow each panelist to respond to the full content of the paper. We agreed that each would concern himself with a particular part of the total statement. I was assigned that portion which is devoted to the understanding of "music theory itself." I have been requested to concern myself with that same portion here.

The term "theory" has such a variety of meanings and applications that it is impossible to proceed without detailed definition. The stem of theory, theorist, theorem, theoretic and similar derivatives is the Greek word for "sight." In Greek antiquity, theor designated an ambassador or envoy sent by a state to consult an oracle or to perform a religious rite. Theorus (in Greek and in Latin) means "spectator." Theory (L. theoria) = viewing, a sight, spectacle. Plato's use of the word "theory" described "a contemplated truth." Aristotle elaborated this to mean "pure knowledge as opposed to practical knowledge."

The S.O.E.D. includes five definitions of theory. The first of these is obsolete. The fourth and fifth definitions are non-specific and not applicable here even though number five, which describes theory as "a hypothesis proposed as an explanation; hence a mere hypothesis, . . . an individual view or notion," states a quite common conception of theory. Definitions 2 and 3 (especially 3b.) are more clearly applicable to music theory. They are:

> 2. A conception or mental scheme of something to be done, or of the method of doing it; a systematic statement of rules or principles to be followed.
>
> 3a. A scheme or system of ideas or statements held as an explanation or account of a group of facts or phenomena; a hypothesis that has been confirmed or established by observation or experiment, and is propounded or accepted as accounting for the known facts; a statement of what are held to be the general laws, principles, or causes of something known or observed.
>
> 3b. That department of an art or technical subject which consists in the knowledge or statement of the facts on which it depends, or of its principles or methods, as distinguished from the practice of it.

The dual use of the term theory — as a general term denoting the conceptual knowledge of a subject area, and the more restricted use that describes the rules or principles of a phenomenon within the subject area — is a source of confusion in describing music theory. We are faced with the semantic ambiguity which surrounds any term that can be used in either a general or a specific sense.

The term "theory" has been defined as including pure knowledge, verifiable hypotheses, systematically organized knowledge, statements of general laws, principles and facts. Music theory can and does include all of these. It must be noted, however, that music theory is concerned with musical concepts. It is only incidentally concerned with musical performance, history, or education. Do not imagine that this implies that music theory is more important than these other aspects of music. Each of these has its own identity, and each has its own importance. It ought to be clear that these usual divisions of music study are, to a large extent, dependent upon one another. The professionally-trained musician, whether his primary interest is composition, concert performance, music criticism, or music teaching, must be reasonably informed and competent in the disciplines which the other aspects provide. In spite of an evident difference in terminology, Mr. Kraehenbuehl's list of the responsibilities of the music theorist and the responsibilities that may be inferred from these definitions hardly show a debatable difference in meaning. He says that the music theorist must understand: 1) the process of concept formation; 2) the properties of the acoustical medium; 3) the ways in which acoustical materials may be arranged. I would agree that the music theorist functions at three levels. These three levels, from simple to complex, would be concerned with: 1) axioms, facts or materials; 2) methods, laws or principles; and 3) hypotheses, systems, theories or concepts. Again I would add the provision that these are concerned only with music.

If there is any disagreement between the two statements it is in the remark that the theorist "must understand the process of concept formation." It would be my contention that the music theorist needs to form concepts but he does not need to "understand the process" by which they are formed. I think it would be well worthwhile if he did. But if he concerns himself with this problem he becomes a different kind of theorist, a psychological theorist. Understanding the process of concept formation is not part of music theory. Mr. Kraehenbuehl's next paragraph makes it clear that he, too, believes that "concept formation" is properly a function of the psychologist.

The succeeding statement in reference to the acoustician's development of "methods for measuring and describing the nature of acoustical materials," neglects to point out that the measurement and description are appropriate to music only at the lowest level. The physicist has nothing to offer the music theorist except these physical measurements and I would submit that these were well understood by the musician through direct observation centuries before the physicist devised his "methods for measuring."

The problem that causes greater concern results from the continual pressures for the inclusion of more and more courses in the same four-year curriculum. We come eventually to the place where courses in a subject are replaced by courses for a student or for a

major. For music theory the need for re-appraisal is two-fold. The need arises at the beginning and also at the end of the curriculum. The first is the need to make it clear that the elementary work, which the great majority of music curricula include, devoted to developing the skills of music reading and notation is not music theory. It is preparation for studies in music theory and is, incidentally, an essential service to the performance, history and education areas. The present need and common inclusion of this elementary work in the majority of our college music programs is well documented. Some of us have urged the serious teaching of rudiments and elementary aural training in the secondary school. We have even made some attempts to assist such activities. If our entering freshman students could write the scales of the major-minor system in both the G- and F-clefs and could sing a simple tonal melody at sight the time thus saved in the college curriculum should make it possible for our better students to prepare themselves adequately for graduate studies.

The second need is to make our graduate courses truly graduate studies. There is not only a need but a demand for theoretical studies of the finest quality and completeness at the graduate level. Graduate studies are presently primarily historical studies. The student of music history would imply that musicology is music history. He knows, of course, that this is not true. Even if everything that has happened in the realm of music constitutes the history of music it does not constitute the whole of musicology. The music historian must (sooner or later) deal with music; and, if he does this competently and completely, he must be well-grounded in the procedures, techniques, and information that music theory provides.

Let us prove, if we can, that all graduate music degrees need to include advanced studies in music theory. History is on our side even though some historians are loath to accept the evidence. I believe that there are very few who will not agree to a thoughtful reconstruction of our graduate programs. I also believe that the majority of these people will assist our cause providing we present our case constructively and with intelligible data.

I have written at length about music theory. In closing I would like to describe the music theorist and his activities. The music theorist acts as an explainer; he furnishes nomenclature (often to excess), codifies rules, extracts principles and constructs theories. He will have at hand techniques for analysis applicable to elements and to styles. If he is an experimental theorist he is likely to be a composer; if he is interested in a continuous methodical record of musical styles or of previous compositional methods he will be a historian; if he feels constrained to make value judgements he becomes an aesthetician; if, apart from music, he must explain the meaning of musical concepts or concern himself with musical behavior he will need to be a psychologist.

This man — performer, theorist, composer, historian, aesthetician, psychologist — is the philosopher in music, a musicologist. His knowledge of music theory and his competence as a music theorist are only a portion of the whole even though they may be the major portion.

Discussion by Howard Murphy

An objective appraisal of Mr. Kraehenbuehl's paper is difficult, chiefly because its spirit is admirable however much one may disagree with some of its contents. Furthermore, the scope and breadth of the paper make brief comment difficult. And finally it is impossible to recapture the mood of the MTNA meeting at which this stimulating and provocative paper was read in February, 1959. Hence my comments will refer only to "concepts of reality" and the multiple functions of "a professional music theorist."

Few will deny that both general and musical concepts of reality do exist. To have thought and felt deeply makes their existence self-evident. Both life and music are patterned on these concepts. Yet their existence can only be felt — never demonstrated. Like beauty, they elude definition. The only certainty is that there are many kinds of reality, many different "levels of significance," whose apprehension is limited only by the perception of the participant.

Nevertheless, it should be pointed out that conceptual philosophy is hardly a recognized area of the theory of music — the Greeks notwithstanding. The terms "reality" and "truth" belong to the philosopher and not to the professional music theorist, whose "working area [is] music theory itself." Hindemith states the case clearly when he says "our primary concern is, after all, not philosophy, but music."[1] Who can identify either the general or the musical concepts embodied in the last quartets of Beethoven? Here we are on very dubious ground indeed, namely, the "meaning" of music — a question that probably never should be asked and certainly cannot be answered precisely. True, music has "meaning" for all, otherwise there could be no communication, but the abstract nature of music excludes concrete meanings. Langer truly says "music is a tonal analogue of emotive life...Feeling, life, motion and emotion constitute its import."[2]

Music and "reality" are indeed related, but these are variable terms and mean all things to all people. To inject basic philosophical and aesthetic concepts into a technical description of an art — except on a very high level — invites confusion and misunderstanding. Knowledge in these fields is essential to the theorist — but as background, not foreground. If "our conception of reality remains always tenuous" how can the music theorist make it less so?

Nor will a scientific approach be more productive. Acoustics can explain harmonics but not effective harmonies. Man endows Nature with beauty. Music is an art whose physical roots are scientific but whose products are aesthetic. To explain one in terms of the other only leads to confusion. Science is explained in scientific terms — why not music in musical terms? In the broadest sense there is no "mathematical bases of the arts."[3] But though science alone cannot explain

1. Paul Hindemith, A Composer's World (Cambridge: Harvard University Press, 1952), p. 3.

2. S. Langer, Feeling and Form (New York: Charles Scribner's Sons, 1953) pp. 27 and 32.

3. J. Schillinger, The Mathematical Bases of the Arts (New York, Philosophical Library, 1948).

either man or music, yet a scientific background is essential for the music theorist, together with that of philosophy and aesthetics.

When we turn from Professor Kraehenbuehl's "concepts of reality" to his description of the functions of a professional music theorist it appears that these functions may belong to three types of "theorists" rather than only to one. These three types are: the teacher (Boulanger), the analyst (Schenker or Tovey)[4] and the theorist (Hindemith or Schoenberg), the latter two being concerned with "the development of new and useful theoretical systems." Obviously the functions of each overlap — yet are essentially different. Perhaps a word regarding each would clarify both their differences and similarities.

The teaching of basic musical techniques (writing, analyzing, hearing, etc.) requires skilled teachers. It is very doubtful whether these skills can be taught "as well by any musician on the faculty" even through "teaching methods that are both efficient and effective." Teaching is an art, and the teaching of rudiments is as difficult and specialized as the teaching of piano or of composition. Failure to recognize this fact is responsible for more bad theory teaching than any other single cause. The teacher, not the method, is the crux of learning. Hence the service of the teacher is commensurate with that of the analyst or of the theoretician.

The analyst differs from the teacher in that he focuses upon the classification and clarification of traditional procedures rather than upon the development of skills. The musicologist frequently assumes this role, though sometimes rashly, since he is seldom a specialist in more than one period.

Finally, the true theorist creates theories which clarify present practices and suggest future developments. Granted that these functions of teaching, analyzing and theorizing overlap, yet their combination in one person is as rare as a Hindemith or a Schoenberg. We all know teachers who cannot theorize, analysts who cannot teach, and possibly theorists who can do neither. Nevertheless, all have essential functions; none should be stressed at the expense of another.

Obviously there are no hierarchies of knowledge. All types of knowledge have equal dignity; and an explanation of the "carefully structured abstraction" by any serious composer has equal value. This fact has long been recognized in musicology — it matters little whether the scholar is concerned with the past, present or future. Yet "the professional music theorist must spend the major portion of his time searching out clues which will lead to the development of new and useful theoretical systems." Does this statement imply that the development of theories outweighs in value both teaching and analytic research?

To summarize, the paper under consideration contains so much of value that it is difficult to challenge its general thesis. However, it seems open to criticism on two general points: first, that music and philosophy are difficult to integrate — especially for teaching purposes, and second, that the ideal "professional music theorist" described is actually a trinity composed of the inspired teacher, the indefatigable

4. Also Goetschius, whose exceptional insight into formal structure is shown by his Homophonic Forms of Musical Composition and his Larger Forms of Musical Composition, both published by G. Schirmer in 1915.

analyst and the creative theorist, all of whom have equal dignity and value. The author seems somewhat reluctant to accept the equality of these related functions of his ideal professional theorist, due probably to his own experiences with one or more of these types. Criticisms of the current curricula and "theory pedagogues" are all too well founded — but the deplorable conditions described are by no means universal, and efforts are being made to remedy present conditions.

Professor Kraehenbuehl's paper is an honest and able effort to clarify the training and the functions of the theorist, though, perhaps wisely, little is said about his "habits." Since agreement is lacking among eminent musicians and educators regarding these matters, we are indebted to the author for his conscientious effort to summarize the problem and suggest suitable solutions.

Discussion by Gordon Binkerd

I find myself basically in agreement with nearly all of Mr. Kraehenbuehl's paper. The picture he projects of an intelligently trained and oriented theorist is refreshing and encouraging.

This suggested theorist appears to be in reality a musical historian, i.e. a scholar concerned in the main with systematic knowledge and understanding of the past. Such an historian would interpret the past as beginning with today and extending backwards through time. Concern with the music of our own times as well as that of more remote periods adds a significant dimension to what would otherwise be simply a specialist in the history of music. This kind of musical scholar would fall directly in the line of theorists reaching from the Middle Ages to Mr. Kraehenbuehl's own teacher, Paul Hindemith.

Basic musicianship, that is, training in singing and hearing, is certainly not theory, and I agree that there is no more reason for a theorist to preempt this field of instruction than for any other musician. I agree with his definition of the term "music theory." I agree with his statements as to what functions a music theorist should concern himself with and in which he should demonstrate competence. I agree that the present theorists more often than not exist in a kind of musical no-man's land with their feet on no discernible soil of their own. They are often regarded by their colleagues with suspicion and "bitter amusement," as Mr. Kraehenbuehl says. I agree that the theorist's training should be on a par with that of any other specialist. I agree that he should be a demonstrably gifted musician, either as a composer or as a performer, or both. I agree that he should be trained in scientific method. I agree that the theorist should be charged with providing understanding to the performer, whether the music be old or recent. Both the present-day composer and performer are at a great disadvantage in their lack of any kind of intelligent codification of operating principles. Scholars who develop a theory of composing procedure related to our own times would perhaps do as much for the significant progress of the art as any composer or group of composers. I agree that the music faculty, no matter how small, should include one of these envisioned theorists. I also would agree that a real stumbling block to progress in this direction lies in the present body of theory

teachers.

I do have some disagreement, however. I wonder if it is true, as Mr. Kraehenbuehl says, that "music theory may have little or nothing to do" with harmony and counterpoint. The bulk of the European musical heritage is either harmonic in nature, contrapuntal, or possesses some combination of both. Any theoretical concern with that music, then, would be intimately bound up with the harmonic and contrapuntal aspects of it. If this be so, then the "study" of harmony or counterpoint would seem a natural occupation.

I am not so prepared as Mr. Kraehenbuehl to throw out the actual writing of fugue or the admittedly artificial practice with species counterpoint. I do not agree that species counterpoint is unsatisfactory as a basis for understanding renaissance counterpoint. Theorists of the 15th and 16th centuries speak continuously of the treatment of dissonance in accordance with the temporal value of the note and its rhythmic placement, and this seems to me to be a satisfactory definition of species counterpoint. In fact, of all theoretical procedures in use today, that kind of treatment to be found in Jeppesen's books on the music of Palestrina seems the most nearly related to what Mr. Kraehenbuehl proposes as valid theory.

To answer Mr. Kraehenbuehl's question as to why anyone today should learn to write a fugue, I must speak only with respect to my own training as a composer. The study of Bach fugues and the Gedalge fugue book with Walter Piston proved the most important single factor in my preparation as a composer. When one attempts the writing of any of the contrapuntal styles of the Renaissance, one is slightly surprised on finding how easy it is. Leaving aside the matter of accurately reproducing the individualities of the various composers, one soon finds that the relating of voices to each other intervalically makes for realtive ease of handling. Similarly, a fair example of "modern" counterpoint can be rather easily written, since here also so much emphasis is placed on intervalic relationships. When one is forced, however, to produce a like contrapuntal freedom within a relatively restricted and demanding harmonic framework, as in the 18th-century fugue, one finds significant difficulties. It is an exercise which makes more telling demands upon the composer than any other technical form and puts the composer very much on his mettle. But this is not only an academic exercise. In my opinion, the unrestricted contrapuntal freedom of much of today's music must eventually come to grips with an organized harmonic framework, and when that happens the composer may be writing under very nearly the same circumstances as when he is trying to produce a "Bach fugue." I do not know of anything else which so develops the composer's ability to produce meaningful lines against a clear and intelligible harmonic foil. It is true that fugue lends itself to teaching, but it resists strongly to writing.

In my opinion there are three broad types of combining parts, and they are all important today. The first is the kind of polyphony written during the Renaissance, where the binding factors are interval and mode. The second is that of 18th-century counterpoint built upon an imperative harmony. The third is that found in the 19th century where harmonic organization is predominant, and where counterpoint is to a degree vestigial. The writing of the present and of the future is not

likely, in my opinion, to uncover a further comparable method of combination.

I think a distinction should be made between the musician, at least insofar as he is a composer, and the natural scientist. The scientist is concerned primarily with current matters. As Mr. Kraehenbuehl says, "the past is summed up for him in a few general principles which he can observe in action in a series of carefully selected laboratory experiments." The difference seems to me to be that which separates a science from an art. The scientist is inclined to dispose rather quickly of past achievements and to dwell upon the present and future. A work of art, once produced, takes on a kind of timeless quality and may be as significant now as it was five hundred years ago. Also, the musician, as distinct from the scientist, is much more concerned with developing skills, and difficult skills they are. The composer learns by his own experience, but also by absorbing the experience of the past. In this connection, it is somewhat disturbing to me to hear Mr. Kraehenbuehl say that tradition for the composer is "the activity of the immediately preceding generation, perhaps even little more than the music of the past few years." And again, "the music of his own century, the only music that will be of any great significance to him within 20 or 30 years."

It will be noted that most of my objections concern the training of the composer. I should like to make the point, however, that often the composer is a musician who has been trained as a performer or as a historian, and who only eventually emerges as a composer. For this reason, if for no other, I believe we must keep in our curricula those aspects of our art which attempt to keep alive the basic skills of the past.

Discussion by Robert Melcher

Most theory teachers agree that standards, procedures, and course contents in their profession have too long been static, and in some areas even nonexistent. For theory study on the graduate level, Mr. Kraehenbuehl has provided some stimulating and provocative ideas, and it is sincerely to be hoped that many of his goals will be realized in considerably less time than the thirty to fifty years he prophesies. But when his suggestions are applied to the undergraduate level, serious doubts arise in my mind, for it seems to me that he fails to distinguish between the needs of graduate and undergraduate students and the kind of teaching required in each of these fields. I shall therefore restrict my comments to the effects of Mr. Kraehenbuehl's recommendations as they bear upon the teaching of music theory at the undergraduate level.

Mr. Kraehenbuehl says that the course of graduate study he proposes would develop the student into "an excellent theory pedagogue." But would it? The possession of a vast store of knowledge is not enough in itself to make one a successful teacher on the undergraduate level. The teacher of undergraduate students must, indeed, be a scholar, but he must also be able to present his knowledge to immature minds in a clear and stimulating fashion. Although graduate schools have produced

men and women who have developed into skillful teachers of beginning students, the success of these people often seems to be in spite of the advanced study they have done rather than because of it. We have all known young men and women, fresh from their graduate studies, who have been so long immersed in esoteric problems that they have lost all contact with the undergraduate mind. When faced with a class of elementary students, they are often at a complete loss to know how to proceed. As a result, some of the most ineffective and unstimulating theory teaching to be found on the undergraduate level today is being done by these people.

In the graduate school, where students are mature and possess at least a reasonably good background in the field of their specialization, the teacher, although he be dull and uninspiring, may be successful because of his profound scholarship. But in the undergraduate school the teacher must be not only a scholar but also a skillful pedagogue. This aspect of the teacher's equipment Mr. Kraehenbuehl ignores completely.

It is, however, most encouraging to find that Mr. Kraehenbuehl says that the professional theorist must be "first and foremost a musician," that "his knowledge of music, through first-hand experience of composing and performing music, should be greater than that of any other musician." This is, indeed, the first ingredient of the successful theory teacher on any level. Although he need not be a performer of concert calibre, he should be able to perform well on at least one instrument, most practically the piano. But what is even more important, he must have a wide acquaintance with musical literature of all periods and for all media. For theory is the study of <u>music</u>, and elements of musical construction can always be far better demonstrated by excerpts from the great composers than by exercises concocted by the average teacher. Certainly "no graduate school should accept as a theory major a student who has not already demonstrated a high degree of practical musical skill...the current practice of dumping practical failures into theory programs is reprehensible...if you can't make music, you certainly can't talk about it."

Although the development of skill in performance and/or composition, the knowledge of musical literature, and the acquisition of scholarship are indispensable ingredients for a successful teacher of undergraduate theory, they alone will not necessarily equip him for this profession. While it is true that some people seem to be "born teachers," many others must learn this skill. For such people, basic courses in general and educational psychology and in the pedagogy of music theory are essential. Mr. Kraehenbuehl rightly points out that many private teachers fail as theory teachers, but I think that their failure is not always due to their lack of interest in the subject but rather to their inability to handle a group of students in contrast to one private student. All teachers need to know how to work with human beings; unless they possess this knowledge "instinctively," they must acquire it in courses dealing with human conduct and the teaching-learning processes.

Most teachers begin by teaching in the ways they were taught, and unfortunately some continue in that fashion for the rest of their professional lives. Because theory courses are concerned only with the

elements of musical construction and not with information about how to present this knowledge, courses in the pedagogy of theory are most valuable. Here the student will become acquainted with the various standard textbooks (whether we like them or not); he will learn a variety of ways of teaching, of presenting material, of making effective assignments; he will observe many different teachers; and he will do supervised teaching under expert guidance. This, I believe, is an essential part of the training of any theory teacher.

It is true that much that is called theory in undergraduate courses is not really theory at all, but rather, basic musicianship. Mastery of the skills of sight-singing, ear-training, and keyboard-training are, however, vitally important to the musician. Without them no student can lay the groundwork for the professional theory study that Mr. Kraehenbuehl recommends. I seriously doubt that these skills "can be taught as well by any musician as by another." Here Mr. Kraehenbuehl is recommending the very thing which he deplores in schools in which all theory teaching is done by applied music teachers. Neither do I believe that these skills should be "partitioned off into separate courses" and that they be taught "without reference to theoretical principles at all." Even if it were possible to master these skills without reference to theoretical principles (and this I doubt), these skills will certainly be much more meaningful to the student if they are integrated with his knowledge of theory. While it is true that "one does not need to know the theory of scales to play scales at the keyboard," do we want our students to play even a scale without some realization of its construction? Of what value is that except for the development of digital technique? And the development of digital technique is scarcely the province of the theory teacher. Is one a musician who sings a melody without any awareness of its harmonic background, of the formal and rhythmic organization of its notes; is one a musician who takes down in dictation a melody or harmonic progression without any concern for its musical meaning; is one a musician who plays an harmonic progression or improvises an accompaniment to a given melody without knowing what he is doing? I cannot believe that this is the kind of person Mr. Kraehenbuehl wants in his graduate courses. If the undergraduate school is to provide solidly trained musicians for the graduate school, these elements of basic musicianship must be taught by a skillful teacher who is a member of the theory department, and they must be thoroughly integrated with the student's theoretical studies.

The division of these various skills into separate classes and their isolation from theoretical knowledge may be condoned only if the theory teacher is concerned exclusively with the intellectual parts of his course. But the musical scholar who knows only the cerebral aspects of his art is as much to be deplored as the performer who merely plays or sings the notes of a composition without understanding their meaning.

The ever-increasing musical vocabulary of the 20th century presents a serious challenge to the theory teacher. Certainly some short cuts must be found, but, as yet, our learned scholars have provided precious little assistance to the undergraduate teacher. The principles of harmonic and melodic motion as propounded by Heinrich Schenker

and later developed by several other theoreticians do, certainly, provide some help here. The basic principles of motion are necessary if the students are to go beyond the bare grammar of chord construction and to gain some insight into the meaning of harmonic movement. But unless the students also come to grips with detail, we are likely to have only vague "music appreciation." Indeed, Schenker always insisted that it was the detailed working out of the basic movements which created the musical interest. In addition, all books based on Schenkerian theories presuppose on the part of the reader a thorough grounding in "academic" theory. One valuable contribution the graduate schools could make is to create a textbook which will embody new principles and provide some shortcuts for the harried theory teacher.

Not only are we faced with the need to explain the new music of the 20th century, we must also keep pace with the constantly growing interest in and knowledge of music of the earlier centuries. Twenty-five years ago an undergraduate course in species counterpoint was considered adequate. Today, fortunately, almost no schools waste the student's time on such sterile activity. But we must provide courses in 18th-century counterpoint for our many students who will perform and conduct the works of the baroque period. We must also provide courses in 16th-century counterpoint for our students who will conduct choral groups, as well as for all who have an honest interest in the music of this great period. As recently as a few years ago it was considered quite sufficient in such a course to study only the works of Palestrina; we now realize that his music represents only one of the various styles of that great century, and that other composers of that era must also be studied. And we cannot stop with the 16th-century; we must study the great works of earlier periods which have been brought to light.

How can all this be included in classes on the undergraduate level? I am sure I do not know, but I am also sure that the answer does not lie with the elimination or even the slighting of the masterpieces of the 18th and 19th centuries. While I in no way discount or disparage the rich contribution contemporary composers have made and are making to our cultural life, I find it hard to believe that music of the present century will be "the only music that will be of any great significance to him [the student] within 20 or 30 years." To say that "at the undergraduate level, certainly, only that which helps the student to a better understanding of musical forces and musical communication, particularly in our own time, should be taught" is an admirable generalization. But when a student is just beginning the study of the French language, he is not plunged into the works of Rimbaud, Anouilh, or Sartre until he has gained a basic vocabulary in the language and has read authors of simpler styles. The same is true in teaching the language of music.

Because such composers as Bach, Mozart, Haydn, Beethoven, Brahms, Chopin, Schubert, and Schumann have much to communicate, their compositions have long formed the bulk of the standard repertory for both the performer and the listener, and I strongly suspect that they will continue to do so for many years to come. Certainly public funds would not "be made available to a high-school whose driving course was discovered to be concerned entirely with the problems of

driving horses." Horse-drawn carriages are now a totally outmoded means of conveyance, but I doubt if music composed before 1900 is equally outmoded. Are horses and Händel really equatable?

Teaching has never been perfect, and never will be. We are all aware of a variety of inadequacies in theory teaching on the undergraduate level, but bad as it may be in some respects, it has been good enough to provide our newly burgeoning graduate departments with some fairly well-prepared students. Instead of berating so soundly the lowly pedagogue, does it not behoove our scholars to pay him some debt of gratitude, or at least to pay him his due? It may be true that "most of our so-called 'music theorists' fall short" in some of the requirements set forth by Mr. Kraehenbuehl, but I seriously doubt that most of them "fall short in every respect and often by considerable degree." And if they do fall short, I wonder if the fault does not lie with the graduate schools as much as with the teachers themselves. How many graduate schools even today offer the kind of courses Mr. Kraehenbuehl recommends? And the theory teacher who finished his undergraduate work as recently as 25 years ago had almost no place to turn for further study. That Mr. Kraehenbuehl is well aware of this is shown by his questions: "How many music schools offer a course in the techniques of theoretical investigation? How many schools offer a course in the history of theory where the main stream of theoretical thought through the centuries is laid out systematically? And, finally, how many schools can develop creative theoretical activities?" And one can only recognize the lamentable truth of his statements: "I might ask where the young composer of today will find the effective theoretical summaries of recent practice that would help him so much in developing rapidly toward a style of his own? Due to the almost total absence of any creative theory in our time, they barely exist." Is it, therefore, fair or even accurate to state: "This is a tragedy that can be laid directly at the doorstep of the theory pedagogues?" Are not the graduate schools really to blame? Let the shoe be worn by the foot that fits it.

Perhaps I was unusually fortunate in the teachers with whom I did my undergraduate study (1928-32), but I was never "encouraged to assume that I had learned theory... that was that." Certainly the horizons of full-time professional work in music theory have vastly broadened since my own undergraduate days beyond anything I (and probably my teachers) ever dreamed of at that time, but my teachers always made it clear to their students that solid training in undergraduate work was but an opening to richer fields still to be explored. Nor have I found that theory teachers are "all too often persons who have failed in practical music altogether." Obviously Mr. Kraehenbuehl and I have not known the same theory teachers!

In addition, I find it hard to believe that Mr. Kraehenbuehl is really serious when he says: "I can well imagine that many would regard the actions of this theorist [the one who is working on a new theory to replace the theories of harmony founded on the overtone or partial series] as presumptuous in the light of the 'facts of harmony!'" How many are there who have not long recognized the inadequacies of this old theory? We can only ardently hope that the commendable efforts of this enterprising scholar will bear good fruit and that his findings

will be made available to all. Rather than ridiculing the results of such research, the pedagogues will welcome them with jubilation and gratitude.

There is no doubt that our profession needs the kind of theorist — the creative theorist — that Mr. Kraehenbuehl describes. But I seriously doubt that the imperfections of theory teaching on the undergraduate level would be removed by placing such people in these positions, if, indeed, these scholars would be willing to accept such humble duties. Perhaps what our profession needs is two kinds of graduate programs, one to develop the research theorist and one to develop the classroom teacher. For the first Mr. Kraehenbuehl has already provided some stimulating suggestions. But for the second a very different kind of program is required. I am not suggesting a "watered down" doctorate for the teacher. In fact, I would envision a course of the highest possible standards, one which would enable the student to become both a scholar and a very skillful classroom teacher of undergraduate students. Both the "professional theorist" and the "pedagogue" must be products of a graduate school, but since their duties, functions, and contributions will not be identical, neither should their training be.

Unquestionably every activity breeds a certain amount of vested interest. But is this not true of the graduate as well as the undergraduate school? As Dr. Earl J. McGrath points out in his book, The Graduate School and the Decline of Liberal Education, the liberal arts college has so long been under the domination of the graduate school that it has ceased to function as an entity in itself and has become almost exclusively a place to prepare students for later specialized study. Are music schools to suffer the same fate? Among his remedies, Dr. McGrath proposes a training for college teachers which is different from that designed for other graduate students who expect to make research their life's career, and the rewarding of skillful teaching on an equal basis with research and publication.

While acknowledging the desperate need for that "rare bird," the professional theorist, we must also acknowledge the desperate need for a better trained species of his "more common distant relative, the theory pedagogue." If the former is ever to evolve, he will first have to pass through the tutelage of the latter. Mr. Kraehenbuehl is totally correct when he says: "And we should not forget that no curriculum is better than the individual teachers that carry it out." The only question that remains is what kind of teacher is needed at each level.

Rather than scorning the lowly pedagogue, let the graduate schools set about their rightful business of developing not only research scholars but also better and better teachers for the undergraduate level. Unless such a genuine effort is made no professional theorists are likely to come into being.

THEORY FORUM

RE: A NEW CONCEPT OF TONALITY (?)

By Ernst Oster

In his article in the November 1959 issue of the Journal of Music Theory, Roy Travis compares the structures of excerpts from compositions by Stravinsky and Bartók to those of excerpts from works by Mozart and Chopin. He states that although these compositions appear to be heterogeneous, they embody structural principles which are basically similar. According to Mr. Travis, the main difference between these works lies in the fact that the older "unfold through time" a particular triad, whereas, the more recent may unfold a particular interval or tone. Mr. Travis goes on to say that any composition which demonstrates the unfolding of any tone or any interval whatsoever is to be considered "tonal," and that that particular tone or interval "identifies the tonality."

Let us not discuss the question of how it is physically possible to unfold a single tone. Mr. Travis neither presents nor does he refer to an example of this kind. However, it must be said — since Mr. Travis did not say it — that the very idea of unfolding in time originates with Schenker, not with Mr. Travis, and that since Mr. Travis uses the terminology Schenker created in order to describe the phenomena which he observed for the first time[1] he must bear the brunt of a critique designed to set the record straight, to make clear Schenker's position in relation to those who have utilized his concepts and techniques with something less than success.

To allow Mr. Travis as much credit as possible for adhering to ethical scholarly practice, we note that he does mention Schenker's name on p. 261 (and only there). But the manner in which he does this must be strongly objected to. The time is past when one could very conveniently use some of Schenker's ideas, no matter how badly applied or distorted, without as much as mentioning his name. This happened of course during the Hitler regime, but the same kind of literary piracy was to be found even earlier.[2] In the book by Woehl,[2] for example, some passages are taken almost word for word from Schenker's publications. At this time many musicians read and studied Schenker, but very few spoke about him or mentioned him in writing. One of the few exceptions to this was Wilhelm Furtwängler, who for many years visited Schenker regularly to go through scores with him which he was to conduct. Furtwängler also financed the publication of one of Schenker's last books, Das Meisterwerk in der Musik, Vol. 3 (München, 1930). (The receipts are in the author's possession.) Das Meisterwerk in der Musik, Vol. 3 contains a truly amazing exposition — one cannot call it an analysis — of Beethoven's Eroica Symphony. In words and by means of countless musical examples it describes the over-all structure of each

1. For example, "prolongation," "transfer of register," "motion into an inner voice," "passing chords," "octave-filling motion."

2. For example, Waldemar Woehl, Melodielehre, Leipzig, 1929; Rudolph Steglich, Johann Sebastian Bach, Potsdam, 1935; Bernhard Martin, Untersuchungen zur Struktur der "Kunst der Fuge" J.S.Bachs, Regensburg, 1941.

movement, the branching-out into more and more detail, and finally the minutiae of the "foreground" in one continuous "picture" (Bild).

But to return to Mr. Travis — just before mentioning Schenker in his article, he speaks of the Eroica Symphony, and asks: "What do we mean when we say that the opening movement of the Eroica Symphony is in E^b-major?" His answer is: "that all its details, subsections, and sections, however complex, however seemingly independent, somehow partake of one, single, organic motion through time — a motion which unfolds through time the E^b-major chord. It staggers the imagination to attempt to define the precise role of every single note within such a motion. It is hardly more difficult to demonstrate the exact function of every single cell within a living organism. Heinrich Schenker..." Here surely we expect: "...accomplished this prodigious task in his book, Das Meisterwerk in der Musik, Vol. 3." But is this what Mr. Travis says? Far from it! He goes on: "[Heinrich Schenker] initiated certain principles and techniques of analysis-still in the process of evolution — which attempted to do just that [emphases mine]."

This phrase, "initiated certain principles," implies that Schenker produced a few hazy, half-baked ideas which, though useful, are "still" in need of amplification and modification. Yet, anyone who has taken more than a superficial look at Schenker's publications — and this apart from the question of whether he agrees or disagrees — sees that Schenker shaped and united his ideas into a comprehensive system which deals with every feature of tonal music up to approximately 1900, a system which one might compare to a great system of philosophy. Which "principles" did Schenker omit, how many did he leave in an embryonic state of development? The last sentence of Mr. Travis which was quoted above may be interpreted in two ways. First, he apparently feels that Schenker's "principles" should be stretched in order to make them applicable to non-triadic compositions. Second, he seems to feel that these same principles, even when applied to Beethoven, are merely in their "initial" stage and need much further development in order to come to full fruition. After all, he says that these "certain principles attempted to do just that"[namely to expound a composition of the scope of the first movement of the Eroica in all its complexity]. Here one must ask: Does Mr. Travis seriously consider Schenker's Eroica study a mere "attempt," or does he simply not know of its existence? (One can hardly imagine that he purposefully would have omitted reference to it.) Most probably he does not know of its existence,and, as we shall see later on, Mr. Travis is quite unfamiliar with the contents of two more of Schenker's important publications.

It is an unfortunate coincidence, then, that Mr. Travis chose to describe of all things the Eroica as such a staggering task, since he apparently was unaware of Schenker's "attempts" in connection with this symphony.

The former conspiracy of silence against Schenker seems now to be giving way to repeated attempts to belittle him while still using his ideas where feasible. Felix Salzer, in the introduction to his Structural Hearing (New York, Boni, 1952), uses language similar to that of Travis. He writes that "certain definite modifications" of Schenker's work had to be made, without giving the reader of his voluminous work (2 volumes, 300 pages of text, and 365 pages of examples) an inkling of what these "certain definite" modifications were. Are we to conclude

from this that the latter, namely Schenker's original, unmodified ideas, are not of sufficient interest to be presented? And it is completely in line with this attitude that Mr. Salzer, on page XVI, comes out strongly against an English translation of Schenker's books. He tries to justify this standpoint by implying that Schenker's own interests would be served better if his diffuse, unsystematic writings were withheld from the public and replaced by a clearer presentation of his teachings, namely by that of Salzer. This patronizing attitude is an outrage. Its absurdity becomes clear when one considers whether Schopenhauer or Hegel would have come out in public against the publication of Kant's writings. This kind of thing must not continue. To give merely token credit to a man of Schenker's caliber is plainly unscholarly. Mr. Travis' reliance upon second-hand information, namely, that provided by Salzer's Structural Hearing, instead of going back to the sources, is also hazardous — we will soon see to what extent.

Many a conceptual system can be expanded, developed further. Possibly this could apply also to Schenker's conception of music. But two requirements must be satisfied by anyone who proposes to undertake such a task: he must know thoroughly the existing system, and his capabilities must be somewhat commensurate with those of the system's originator. As to the first requirement, we have seen that Mr. Travis apparently is unaware of the very existence of one of the last and most important works of Schenker, and we will see below that he is not too familiar with some of the other Schenker books. Judgement regarding Mr. Travis' fulfillment of the second requirement can be made by considering the practical application of his theoretical concepts to examples from Stravinsky, Bartók, Chopin, and Mozart. This writer was not convinced by Mr. Travis' analytical interpretations of the Stravinsky and Bartók examples. Moreover, he finds the analyses of the Mozart and Chopin works full of rudimentary mistakes. Clearly, one cannot expand Schenker's ideas when he makes basic mistakes in their application; nor can one draw correct conclusions from Chopin to Stravinsky, from the old to the new, if he begins by misinterpreting the old. A discussion of Mr. Travis' errors follows.

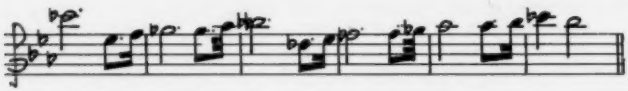
First, let us consider Mr. Travis' Ex. 19 (Chopin's Etude in C minor, Op. 10, No. 12). This reading differs substantially from Schenker's very detailed and carefully worked-out analysis in his Fünf Urlinie-Tafeln (Five analyses in sketchform), which were published in 1932 by Universal Edition, Vienna, and distributed in America under a different cover by the David Mannes School, New York. At that time Schenker's pupil, Hans Weisse, held a teaching position at this school and made extensive use of the publication. Strangely enough, after Weisse's death in 1940, it fell into oblivion and was no longer used. But even now a number of copies are still available. Moreover, one would assume that Mr. Travis knew of the existence of these analyses since he received part of his training at the Mannes School. Also, Schenker published several parts of the same analysis in his last, posthumous work, Der Freie Satz (second edition, edited by Oswald Jonas, Universal Edition, Vienna, 1956): Exx. 12a; 73, 1; 83, 1; 114, 10; 119, 14. If one compares Mr. Travis' analysis to that of Schenker, one cannot help feeling that of the two readings, Schenker's is far superior. We refer the reader to Der Freie Satz and to the Five analyses to let

him judge for himself. Nevertheless, two details are worth mentioning here. Why does Mr. Travis, in the upper staff of Ex. 19, m. 9, relegate the E^{b} to an inner voice and continue thereafter to notate the two voices in an upside-down order, although on the second staff, and especially in the composition itself, E^{b}, D, etc. lie clearly on top? Needless to say Schenker reads the line in the latter way. Also, Ex. 19 is supposed to show mm. 29-32 (Exx. 15 and 15a) in their "original context." Schenker reads here (simplified):

Example A.

i.e. a prolonged A^{b} harmony with the tones of the outer voices exchanged and with C^{b} changed to $C^{\natural}$ (cross-relation). B^{bb} of the upper voice is a passing-tone and is supported by the consonant bass-tone G^{b}. The necessity for reading the passage in this manner becomes evident if one considers that mm. 29-33 form a motivic entity comprising the main tones C^{b}-B^{bb}-A^{b}. In Example B we quote the passage enharmonically changed and in Chopin's original rhythmic notation which gives added emphasis to B^{bb} and A^{b} through the doubly-dotted rhythm preceding them.

Example B.



At A^{b} the sequence is discontinued, and in addition, the figuration of the left hand changes there. Such a change of design always indicates the end of a structural entity. Thus, the one under consideration, having begun with the A^{b} triad in m. 29, ends here with the A^{b} 6-chord (on C). The bass-tone G^{b} in m. 31 can be heard only in conjunction with the passing-tone B^{bb} in the top voice. Therefore it cannot be effective beyond the passing-tone motion of the top voice (mm. 29-33) and lead to F in m. 37, in the way Mr. Travis shows. One wonders seriously whether Mr. Travis knew Schenker's analysis at all. Certainly he would not have misread the composition in this way if he had considered Schenker's reading.

In analyzing the two Mozart examples, the trio from The Magic Flute and the rondo from the Piano Sonata, K. 333, both in B^{b} major, Mr. Travis falls into the same trap twice: In The Magic Flute he reads the return of the structural I, the B^{b}, prematurely, in m. 38, whereas it should be in mm. 49/51; in the rondo he reads the return of the structural I, prematurely, in m. 94, whereas it should be in m. 111 where the main section returns. The earlier B^{b} harmonies are in both cases mere subsidiary chords, appearing between structural harmonies

of a higher order. To provide further elucidation, there follows an analysis of mm. 56-106 of the rondo from K. 333 (Examples C and C_1).

Example C.

As Mr. Travis implies, the bass moves from B^b over G to E^b (his Ex. 14). However, the E^b chord is not merely another passing chord moving to C; it is Mozart's goal, the IV in B^b major, which will later move on to V-I. Or, in terms of "keys," the main key of this rondo section is E^b major, the last E^b (minor) harmony appearing in m. 99. The fact that E^b in m. 76 is Mozart's goal, and not just another passing-chord, is indicated by him through the strong preparation (whole-notes etc.) and especially by the way in which the chain of motives which begins in m. 56 is interrupted in mm. 60-62 and then (most astonishingly) is resumed in m. 76 (Example D).

Example D.

What a wonderful way to point out the beginning and end of the bass motion B^b-E^b! Mozart virtually clamps these two points together by initiating the rising chain of motives, veering off, and then resuming at the most important point of this rondo section. And he "celebrates" this resumption by means of the springy dotted rhythm in which the motive now appears.

Motivic designs of this kind must be perceived and understood if one seeks to arrive at a valid analysis. They form an integral, essential part of any composition. To disregard them, to concentrate only on large-scale background progressions leads inevitably to an arbitrary picking-out of notes, i.e. faulty reading. It is perhaps not generally known that from the beginning to the end, both chronologically and procedurally, the foreground came first in Schenker's work — not vague speculation on background connections. All his books, including Der Freie Satz, are full of the most beautiful foreground readings, and any large-scale analysis had to be in accord with the design of the foreground, the actual appearance of the composition. Nothing of this nature shows up in Mr. Travis' analyses. He does not know the foreground, nor does he know the real Schenker.

Space limitations prevent us from considering the following pertinent questions: Why does the motivic chain "veer off" at m.62 (Ex.D)? Why does the composer separate the motive appearing in mm. 60/61 from its reappearance, one step higher, in m. 76? What is the special purpose of the intervening G-minor section? Questions such as these should be dealt with and answered — as far as possible — if one wants to arrive at a comprehensive, penetrating analysis. A clue to their solution is provided by the close melodic and harmonic similarity of mm. 63/64 (which introduce the G-minor passage), to mm. 71/72, where G minor is left and a motion is begun toward E^b (marked by brackets in the bass of Ex. C). The G minor is thus "enclosed" by the same progression. This creates an impression very similar to the one described above, where we stated that m. 61 finds its continuation in m. 76: in mm. 71/72 Mozart picks up the threads which he dropped in mm. 63/64, thus further emphasizing the fact that E^b in m. 76 is the real goal, that it is the subdominant in B^b major.

As Examples C and C_1 show (p. 89), the B^b chord in m. 94 (marked with an asterisk) which is supposedly the return of the tonic is merely one of two auxiliary-note chords which implement the change from G to G^b in the upper voice. Again Mozart's foreground denies Mr. Travis' reading. If Mozart had meant m. 94 to be a point of great structural importance, he would most certainly have reintroduced the main motive here, not four measures earlier. Finally, Mr. Travis' third passing-chord (the C-minor triad in m. 92) is due only to the motive G-E^b-C in m. 90, not to any harmonic or broader scale structural considerations. C of the right hand replaces, as an auxiliary-note, the B^b of the E^b triad which would normally appear here, thus creating only the semblance of a C-minor triad.

In mm. 99-101 the outside voices are exchanged (see arrows in Ex. C) and the resultant augmented-6th chord leads to V. This is a strong, very cogent kind of voice-leading, which introduces a major harmony emphatically. It is frequently found in the classical literature. Its appearance here should have made Mr. Travis suspect that what follows is the main V which only then leads to the structural I in m. 111 (instead of m. 94). But Mr. Travis seems to be unfamiliar with this voice-leading pattern. Schenker pointed it out at the very beginning of his Eroica analysis (Ex. 2, 3, and 6) with reference to mm. 1, 44, and 45 of the first movement, where we find exactly the same notes, except that an E^b major chord occurs at the beginning. However, Mr. Travis does not know this book. He seems not to know Der Freie Satz either,

where Schenker, in Ex. 115, 2, quotes and discusses this very progression in the Eroica.

It may be of interest to mention here two more compositions, also in B^b major, where the same progression can be found over even wider spans: In Beethoven's Op. 106 it comprises the whole of the development section; and in the E^b major part of the Adagio of the Ninth Symphony, it ties together in the most beautiful way the beginning of this section and the re-entry of the following one.

In the trio from The Magic Flute (No. 19), the over-all progression is the same as in the rondo: I-IV-V-I (mm. 1, 33, 43, 49/51). But here again, Mr. Travis mistakenly places the return of the structural I at m. 38, that is, prematurely between IV and V, and again it is his disregard of the foreground which causes this misapprehension. Mr. Travis regrets that limitations of space prevent him from "showing the relation of the foreground . . . in all its richness of dramatic characterization, to the underlying motion." One may well ask which features of the foreground Mr. Travis had in mind, since apparently he was unaware of those features which elucidate the actual underlying harmonic progression. A brief glance at the orchestral score shows that the external design changes with E^b, the IV, at m. 33, and that the original design returns with F, the V, at m. 43; i.e. the accompanying eighth-note figure stops with the E^b and is resumed at F. For the first time in the whole composition the oboes play (m. 35); they too stop at the F and remain silent until the I is reached. Further, from the beginning up to E^b, it is Pamina who addresses Tamino; Tamino answers jointly with Sarastro. From E^b on, the roles are reversed: Sarastro speaks and Pamina and Tamino follow. Again, from F in m. 43 on, the initial order is resumed.

This leads us to a consideration of Mozart's treatment of the text. Sarastro's words, "The hour has struck," give the dialogue a new direction. Mozart parallels this turning point by a turning point in the composition, the IV, and by the motion from IV to V.

In mm. 1-13, each solo consists of one line of the text, which results in three groups of 2 + 2 measures. In the following section (mm. 14-21), each singer sings two successive lines so that we hear 4 + 4 measures. Here Pamina's solo is based on C, which leads to F as the main bass-tone of the reply of Tamino and Sarastro. The next part of the dialogue (mm. 22-33) consists of 6 + 6 measures (each consisting of 4 + 2, through repetition of one line). In the poem these two 6-measure groups belong together as statement and answer. Their musical unity is made clear by the similarity of mm. 24-25 to 30-31. As in the preceding section, mm. 14-21, where the bass C prepares for F, one feels that here, too, the G minor is merely preparatory to the unmistakable goal, E^b, the IV. It would lead us too far afield to discuss the exact function of this G. Suffice it to state that for reasons of design, foreground, and other features one cannot possibly understand it as being of the same structural importance as E^b.

The main point is that Mr. Travis' placement of the return of the structural I at m. 38 is erroneous. It does not appear until mm. 49/51. If the motion from IV to V forms the content of mm. 33 - 43, then C in m. 35 (Mr. Travis' "Passing-Chord 3") and B^b in m. 38 (his "I") must be part and parcel of that motion. Ex. E_1 (p. 93) shows the basic pro-

gression of this section: IV to V, the V being preceded by its own dominant (whole-notes in Mozart). Instead of leading the top voice $E^{\flat}$ directly to $E^{\natural}$-F, Mozart takes it down to an inner voice $B^{\flat}$ (arrow). Since it is Sarastro who speaks here, the passing-tones D and C (Ex. E_2) appear in his part. The goal, $B^{\flat}$, before becoming a dissonant 7th, is first introduced as a consonance at m. 38 by means of the octave $B^{\flat}$ in the bass and the $B^{\flat}$ triad. This $B^{\flat}$ triad, which is nothing more nor less than IV in the cadential succession IV-V-I of F major, is what Mr. Travis heard as the over-all structural I. Ex. E_3 does not require detailed comment. The harmonic progression in $B^{\flat}$ major shown there naturally refers to $B^{\flat}$ as the IV of F, not to the tonic of the whole composition.

Observe that the two 3-measure groups, 34-36 and 37-39 (prepared by the 6-measure groups preceding them), make clearly evident the beginning of a new section with m. 33. They result from an overlapping of two lines: Pamina finally resigns and agrees to Sarastro's demand, she almost joins him and also expresses her changed attitude by repeating the main tones of his solo, $E^{\flat}$-D-C (variation). It is particularly beautiful to see the ingenious manner in which Mozart leads back to the 4-measure ordering at m. 44: mm. 40-43 form a 4-measure ordering, but Mozart has written this in such a way that Sarastro as well as Tamino still sing 3-measure phrases! This means that the entire section from IV to V is metrically unified, and thus in this respect also differs from the rest of the composition.

Since Mr. Travis reads the same progression in the two Mozart compositions as well as in the Nocturne by Chopin, and since, further, he also sees it in the Stravinsky example, a few general remarks seem pertinent. Even though this progression does not occur in the Mozart and Chopin examples, we might assume that we would encounter it somewhere in triadic music. However, we will never find it, for it simply does not exist — at least not in the form which Mr. Travis presents, with passing-tones 1, 2, and 3 prolonging an octave. It is true that occasionally a succession of these same chords will be found, but then their meaning will be a different one and will vary from case to case. Mr. Travis adduces Felix Salzer's analogous reading of an ascending passage in the overture to Der Freischütz. But despite the fact that Adele Katz[3] interpreted the same passage in the same way, even prior to the publication of Salzer's book, it is nevertheless erroneous.

Indeed, in Salzer's book, we frequently find bass and chord progressions of considerable length termed "passing," no matter whether the bass moves stepwise, or by thirds, or by fourths, or whether it combines these intervals (Exx. 265, 458: thirds and seconds; 461, 463: thirds and fourths — all from Beethoven sonatas). No further explanations are given for what may have prompted the composer to choose such a peculiar way of writing or how he proceeded in detail. This makes things far too simple. By this method one can easily explain everything — or nothing.

It is true, however, that skips of thirds can be used to subdivide a fifth, seventh, or even a ninth. The bass $B^{\flat}$-G-$E^{\flat}$ in Ex. C shows one of the reasons such a subdivision through thirds is meaningful: the

3. Adele Katz. Challenge to Musical Tradition. New York: Alfred Knopf, 1945, p.5.

Example E

E1
m. 33
42
43
B♭: IV
( ) V
E2
m. 33
38
42
43
F: IV
V
I
E3
m. 33
38
42
43
(B♭: VI II V I)
F: IV
V
I

arpeggio displays the tones of the E^b chord which is its aim; it develops the chord while approaching it, so that the triad finally appears as the sum-total of the arpeggio.

In a few instances, we even find an octave divided into thirds, but in a way different from that which Mr. Travis assumes. In such a case, three major thirds are involved and enharmonic changes are necessary. To the best of my knowledge, this daring way of writing was used for the first time, and for very profound reasons and purposes, by Beethoven in the development section of his Op. 57, mm. 65-87 (A^b-E-C-A^b). It was described by Schenker, in his analysis of the entire sonata (Der Tonwille, Heft 7, Vienna, 1924). Schenker also presented this particular passage in Ex. 114, 8 of Der Freie Satz. Further, Schenker's sketch was reproduced, almost literally, both by Adele Katz[4] and by Felix Salzer[5]. Another occurrence of this uncommon progression is to be found in Schubert's C-major Quintet, middle section of the Scherzo, where it prolongs the dominant, G.

Turning now to Mr. Travis' reading of Chopin's E-major Nocturne Op. 62, No. 2 (his Exx. 9,10), we wonder first why he disregarded D# in m. 6, the bass-tone of the V^6_5. It is almost as though the progression which he propounds were an idée fixe of his, a preconceived notion which he tries to apply at every possible (and impossible) opportunity. Unfortunately, he chose for his article only the impossible ones. Here surely it would have been better to read E-D# (mm. 1-6) as a ninth (a widened minor second) subdivided by thirds. But even this does not bring us much closer to the truth. Chopin's main bass-tones in mm. 1-5 are of course E, C#, A, F# — but that is where the similarity between the analysis and Chopin comes to an end. All the rest is wrong and has nothing to do with the way in which these 8 measures are composed.

To anticipate the result, we have to understand the 8 measures as presented in Exx. F_1 and F_2 (p. 97) for the following reasons. First, Mr. Travis overlooks the fact that the bass line in mm. 3 - 5 forms an entity which extends from C# to F#. This is shown by the octaves, the accelerated downward motion between these two tones, and the crescendo-decrescendo mark (as shown in Ex. H, p. 97) which further unifies the motion. This mark, the only dynamic indication in the passage, is of great significance, as we shall see later on.

Since C#-F# forms an entity, A, which stands between these two tones, cannot be on an equal footing with them. It is merely a connective, an intermediate step between beginning and end of the fifth. With A omitted, the bass progression is E-C#-F#-D#-E, i.e. the common harmonic progression, I-VI-II-V^6_5-I. It is astonishing that Mr. Travis here, as in the Mozart trio, completely neglected harmonic factors, except for I-V-I over the long span, replacing them by very shaky linear ones.

Nevertheless, this passage does have a linear, or rather a contrapuntal aspect. One of Schenker's most profound observations was that every harmonic progression can also be viewed from a contrapuntal standpoint. Both aspects of music exist simultaneously and

4. Adele Katz, op. cit., Ex. 53B.
5. Felix Salzer, op. cit., Ex. 464.

support each other.

Every I-VI-II progression can be understood as the result of a 5-6-5 motion mediating between I and II, as shown in Exx. F_1 and G. The 6 (over E in Ex. F_1) produces a C♯ minor 6-chord. In the composition this chord appears in the stronger root-position as the harmonic VI. Therefore, contrapuntally speaking, E moves directly to F♯; very significantly it moves at m. 5 where the second 4-measure group begins. Further, F♯ of mm. 5 and 6 seems to proceed directly to E in m. 7, as though by-passing the metrically weak D♯. Consequently, the bass in mm. 1 - 7 can be understood as an auxiliary-note motion, E - F♯ - E. Ex. G shows this bass together with the 5-6-5-6-(8) progression, the arrows indicating how Chopin's bass-line results, contrapuntally, from skipping into the inner voice and back. Coordinated with the auxiliary-note motion of the bass, in parallel tenths, are G♯ - A - G♯ in the top voice, and B - C♯ - B in the middle voice. These three auxiliary-note motions are shown by the connecting beams in Exx. F_1 and F_2.

Because of the great beauty of these 8 measures it is not enough to describe their underlying skeleton. When looking at some of the details, we will see how closely they mesh with the structure and confirm it, and how on the other hand they derive their deeper meaning from it. Thus, the large auxiliary-note motion of the inner voice, B-C♯-B, appears at first as a foreground motive in quarter notes (in the upbeat, then continued in the left hand). Note the interaction of right and left hands, so characteristic of Chopin. Above the auxiliary-note of the bass, F♯ in m. 5, this same idea embellishes the auxiliary-note of the inner voice, as C♯-D-C♯ (Ex. F_2), and in mm. 1 and 2, B-C♯-B is immediately taken over by the right hand. The B in the upper voice is to be regarded as a superposition of the inner voice B; accordingly, it continues to C♯ in m. 4 (indicated by the dotted line in Ex. F_2). This is the true origin and meaning of the high C♯. It is not reached from E via D♮, as Mr. Travis seems to believe. Further confirmation is provided in mm. 2-3, where the auxiliary-note C♯ is reflected in the bass motion B-C♯, and finally by C♯-B in mm. 7 and 8.

Another beautiful feature which underscores the structure is the return of the "upbeat" sixth B-G♯ in mm. 6/7, at the point where the bass E returns. Here G♯ is preceded by A, the last appearance of the large auxiliary-note A, so that the sixth is presented at first as the seventh B-A. Rhythmically, however, B and the returning G♯ are most prominent. The same constellation recurs at mm. 8/9 with the repetition of the theme.

Measures 3 and 4 reveal another sixth, E - C♯, defined by the half-notes, the crescendo mark, and its placement at the end of the 4-measure group. This, as well as the underlying melodic motion of the entire 8 measures, is shown in Ex. H(p. 97). The brackets in Ex. H indicate a melodic motive of a higher order which begins with E in m. 3 and ends on the structural auxiliary-note A in m. 5. It straddles the gap between the first and the second 4-measure group and joins them together in the most poetic way. The motive is supported by the crescendo-decrescendo mark which also serves to link mm. 4 and 5.

C♯, which forms the climax in m. 4, frequently has similar significance in the composition. It occurs for the last time in the last 2 measures, in the inner voice whence it began, once more as auxiliary-

note and once more underlined by a crescendo-decrescendo mark as in m. 4. It is followed by the upbeat sixth, B-G♯, which for the last time initiates the motive indicated by a bracket in Ex. H. Thus, the Nocturne ends quietly and peacefully as it began, with the same melodic ideas in the same register. Mr. Travis' interpretation of the first 8 measures does not even suggest this correspondence between beginning and ending.

Our analyses have shown that Mr. Travis' readings contain grave errors. In particular, these appear in the bass and chord progressions which are intended to support his contention that the underlying structures of the Stravinsky and Bartók examples are comparable to those of the Mozart and Chopin examples. Such similarities of structure are purely superficial. Any musical composition, any painting or piece of literature would reveal certain connections, even though it had been pieced together in the most dilettantish way. Somewhere some tone is certain to continue to some other tone, and it is therefore easy to discover horizontal lines well-nigh everywhere. Thus, in non-triadic music we will occasionally find lines and simple progressions that resemble certain lines and progressions in tonal music. However, in tonal music, their deepest meaning and their very existence originate from the triad which they help to "unfold through time" and which they interpret in an endless variety of ways. If this basic premise, this originating principle of tonal music is lost in non-triadic music, any apparent similarity between tonal and non-triadic music cannot be considered a true analogy. Therefore, Mr. Travis did not prove his point, which was to demonstrate analogies between the older and the more recent music. Since the works which formed the basis for comparison, the Chopin and Mozart compositions, were totally misunderstood, any conclusions he draws are obviously invalid.

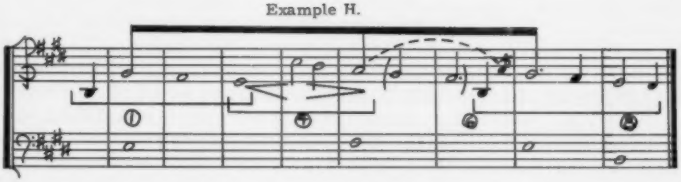
This notwithstanding, Mr. Travis feels entitled to declare that Schenker's "certain principles and techniques of analysis" are "still in the process of evolution." How matters stand with respect to this evolution becomes apparent if one considers that Mr. Travis' article, wherein he makes numerous rudimentary mistakes in his reading of Chopin and Mozart, is proof that he is completely unable to cope with these principles. Yet, he condescendingly describes Schenker as one who just "initiated" and "attempted." This attitude of egotistical effrontery speaks for itself and needs hardly any further rebuke. Again we witness the familiar spectacle of someone who, unable or unwilling to cope with a creative idea from an original mind, tries to put himself into the foreground by tampering with that idea in various ways. It is common practice, for instance, to claim that the field to which the idea pertained is too limited and that it should, indeed does, have a much wider scope than the originator realized. In order to prove this, one merely has to dilute the idea to a point where one or several essential elements become insignificant or vanish entirely; this done, one is indeed free to proceed according to plan and to apply the idea, or what is left of it, to anything whatsoever.

Schenker's basic idea is the projection in time of the triad as given by nature. Mutilate this idea and substitute for triad "a particular tone, interval, or chord" (no matter how dissonant or far-fetched), and an "explanation" for virtually anything can be devised. The appli-

Example F.

Example G.

Example H.



cation of such a diluted idea makes a diluted way of thinking a necessity; thought becomes more general, hazier, less accurate. And, as in matters of the mind, this inaccurate way of thinking does not restrict itself to the new, "extended" field of application, but infects the original field where the most rigorous kind of thinking is required. As a result everything appears in the same haziness; everything seems related and differences in value cease to exist. "Triad," "major seventh," "Stravinsky," "Chopin" — they all are more or less alike. To this myopic kind of thinking everything is equally blurred and equally meaningful, or rather equally meaningless, just as to those who are near-sighted all faces, young and old, pretty and ugly, appear as the same blur. And thus we have Mr. Travis' analyses. Try to hear Mozart's wondrous compositions as Mr. Travis hears them, and they will indeed show a certain resemblance to Bartók.

Mr. Travis' article creates the impression that it represents Schenker's ideas — possibly slightly "evolutionized." As a good musician, the reader will naturally disagree with, or at least feel uneasy about, the Mozart and Chopin readings. And since he is under the impression that "this is Schenker," he will put the blame on Schenker and not on the writer of the article, who must surely know what he is saying. Does not Mr. Travis, himself a follower of Schenker, declare that Schenker just "attempted," that his ideas are "still" not fully developed? This unfortunate situation has come about only because most of Schenker's writings are unavailable, which makes it difficult to find out what he really represents. It is high time, then, that Schenker's own works be published in English translation, especially Der Freie Satz and the Eroica study (Das Meisterwerk in der Musik, Vol. 3). So far, only the harmony book has been made available in English (Harmony, Chicago University Press, 1954). Possibly the analyses presented here will help to dispel some of the confusion and the doubts concerning Schenker which must have arisen in the minds of many readers. It is also hoped that this rebuttal will contribute toward the elimination of a certain unscientific attitude, one which should not be tolerated in any field of knowledge. Schenker's ideas, like those of many other outstanding men, have been attacked, plagiarized, and misrepresented long enough. For the sake of a great idea, in which Mr. Travis apparently believes, let us hope that all of this will soon become a thing of the past and that we shall witness a changed attitude, one of intellectual loyalty and honesty.

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RE: THE INTERVALLIC CONTENT OF A COLLECTION OF NOTES, INTERVALLIC RELATIONS BETWEEN A COLLECTION OF NOTES AND ITS COMPLEMENT: AN APPLICATION TO SCHOENBERG'S HEXACHORDAL PIECES.

By David Lewin

In a previous paper (Journal of Music Theory, November 1959), I discussed intervallic relations between collections of notes. The result obtained was, loosely, this: If P and Q are collections of notes, the "total 'contrapuntal' relations" between P and Q can be precisely

defined by what I called the "interval function between P and Q"; further, given P and the "counterpoint," Q is, to a certain extent, uniquely determined.

In this paper, I shall apply the conceptual material of the previous one to certain other theoretical problems. I shall use the terminology of the earlier paper (q.v.) throughout, with one additional definition: If P is a collection of notes, the complement of P is defined to be the collection of all notes not in P. Thus, in the sense in which I use the word "note," if P contains x notes, the complement of P contains 12 - x notes, and has no notes in common with P. I shall write P' to denote the complement of P.

The first situation we shall investigate is this: if P is a collection of notes, we can consider the interval function between P and itself. We may call this function the intervallic content of P; I shall denote it by p(i).

The question to be examined is: to what extent does the intervallic content of a collection of notes determine that collection? More precisely, if P and Q are collections with intervallic contents p(i) and q(i), and p(i) equals q(i) for every i between 0 and 11 inclusive, what relations must P and Q have to each other?

Before examining the question more closely, I shall discuss briefly the role that complements of collections play in this context.

If P is a collection containing x notes with intervallic content p(i), and P' is the complement of P, with intervallic content p (i), then p and p' are related by the formula:

$$[I] \quad p'(i) = 12 - 2x + p(i) \quad \text{for every } i.$$

Furthermore, if m(i) is the interval function between P and P', m is given by the formula:

$$[II] \quad m(i) = x - p(i) \quad \text{for every } i.$$

From formula I, we see that it will be sufficient to consider collections of six notes or less; for, if P and Q are collections and p(i) = q(i) for all i, then x = number of notes in P = p(0) [by the definition of interval function] = q(0) [by assumption] = number of notes in Q; and then, for any i, $p'(i) = 12 - 2x + p(i) = 12 - 2x + q(i) = q'(i)$, so that P' and Q' will also have the same intervallic content.

I shall now deal with the question raised above. First, it is obvious that transposing or inverting a collection of notes does not alter its intervallic content. Thus, if P is a collection, any transposition or inversion of P has the same intervallic content as does P. Second, from formula I, we see that if P is any collection of six notes, where x = 6, then 12 - 2x = 0, and $p'(i) = p(i)$ for all i. Hence, any six-note collection whatsoever has the same intervallic content as its complement, and therefore the same intervallic content as any transposition or inversion of its complement.

The remarkable fact is that, with very few exceptions, these possibilities are exhaustive. More precisely:

If P and Q are collections of six or less notes, with intervallic contents p(i) and q(i), and if p(i) = q(i) for every i, then either

(1) Q is a transposition or inversion of P or

(2) P and Q are six-note collections and Q is a (transposed or inverted) form of the complement of P or

(3) P (or Q) is a (transposed or inverted) form of the tetrachord C, D, F, F♯, and Q (or P) is a form of the tetrachord B, C, D, F♯ or

(4) P and Q are forms of the pentachords B, D, F, F♯, G, and F, G, A♭, B, C or

(5) P and Q are forms of the pentachords B, C, D, E, F, and C, C♯, D, E, G and these are the only possibilities.

Re category (2), observe that it holds for any hexachord whatsoever (not only those of the type employed by Schoenberg which invert, at some level, into their complements).

Re category (3), observe that the two tetrachords are the "all-interval" tetrachords (employed, for example, by Elliott Carter in his String Quartet).

I am unable to find any explanation for the exceptional behavior of the pentachords of (4) and (5). Note the remarkable fact that the pentachord B, C, D, E, F of (5) is inversionally symmetrical, whereas the other, C, C♯, D, E, G is not; nevertheless, they have the same intervallic content.

We now invoke formula II for wider application of the above result. Let P and Q be collections of six or less notes, with complements P′ and Q′. Let m(i) be the interval function between P and P′; let n(i) be the interval function between Q and Q′. Then if m(i) = n(i) for all i, we have, via formula II, x - p(i) = y - q(i) for all i, where x is the number of notes in P and y is the number of notes in Q. It can be shown (the argument is too technical) that x must equal y in this situation; hence p(i) = q(i) for all i, and P and Q must be related in one of the five ways discussed above.

That is to say: a collection P of six or less notes is characterized, to within the relations discussed above, by the interval function m(i) between P and its complement.

An interesting application may be made here to the hexachordal pieces of Schoenberg, and to similarly composed music. If a piece is based on a hexachord P and is so constructed that, in general, some form of P is always being played against the complementary form — P being distinguished from its complement at any given point, e.g. by instrumentation, melody-accompaniment, etc. — and if the order of notes within the hexachords is not too strictly constrained, then the interval function m(i) between P and P′ will probably exert an aural effect in the long run. Since m(i) represents the "total 'contrapuntal' relation" between P and P′, of course it also represents the "total 'contrapuntal' relation" between any transposed or inverted form of P or P′ and the corresponding form of P′ or P. In this sense, the "total potential counterpoint" in any section of the piece is always the same. And, in the sense of our previous discussion, this "total potential counterpoint" uniquely characterizes P, P′, and their transposed and inverted forms. This may explain in what sense a hexachord has an aural "identity" in

such a piece.

It must be stressed again that indeed this does not explain why Schoenberg used his particular type of hexachord. Certainly there are cogent explanations for his practice in this respect, but they lie outside the province of this paper.

In closing it should be remarked that one can give the necessary and sufficient conditions on the intervallic content of a hexachord such that it would be of the Schoenberg-type. The complete arithmetic formulation of these conditions is too complicated to present here; perhaps of most interest is the fact that every Schoenberg-type hexachord must "contain" an even number of each of the even intervals.

It would be nice to be able to formulate necessary and sufficient arithmetic conditions on a function f(i) for the existence of a collection P whose intervallic content is f(i); and conditions on a function g(i) guaranteeing the existence of collections P and Q such that the interval function between P and Q is g(i). So far, however, I have been unable to do so in any practicable way.

BOOK REVIEWS

Edited by
George H. Jacobson

DIE REIHE. Vol. III: MUSICAL CRAFTSMANSHIP. Original German edition copyright 1957 by Universal Edition A. G., Vienna. English edition copyright 1959 by Theodore Presser Co., Bryn Mawr, Pa., $3.50.

As everyone knows by this time, Die Reihe is strictly a party organ. It speaks for those who are pleased to proclaim themselves the "vanguard," and speaks with the simple assurance of those who know, as its editor, Herbert Eimert, puts it, "the simple truth," that "today, either music exists as it is in the vanguard, or it does not exist at all." The subtitle of Die Reihe (omitted from the English edition), Information über serielle Musik, does not adequately indicate the limits of its program. In a strict sense the term "series" denotes an ordered succession of elements, such as the Schoenbergian twelve-tone set; with Hauer and others the notes of the set are only partially ordered, while in still other cases the set is a collection of pitches the specific ordering of which is a purely compositional question. The term "serial composition" has come to be used as a general designation for music based upon any of the above types of sets, probably because of the difficulty of finding an adjectival equivalent of the term "set." The "serialism" which Die Reihe represents is something quite different. We find it elucidated in Dr. Eimert's article, "The Composer's Freedom of Choice!" "It has reached out and laid its hand on the basic elements," which are to be "guided" into "an abstract system of relationships, a structural web; to bring the latter to its optimum compositional state is what is meant by 'to compose'!" Following Eimert's article Karlheinz Stockhausen describes a method for bringing one of the basic elements, duration, "to its optimum compositional state."

In a review in Notes (December 1949) Charles Seeger, driven to desperation by his subject, suggested that "in all fairness, a book should, perhaps, be reviewed in the style or genre in which it has been written — a poem, in a poem; a technical treatise in a reasoned way; a fantasy in a fantasy." But what is a reviewer to do with a fantasy that is written in the style of a technical treatise? The lack of continuity and coherence in Stockhausen's arguments precludes refutation in detail, for this would require almost as much space as the arguments themselves. I will therefore attempt to discuss, "in a reasoned way," only a few characteristic paragraphs. The reader may judge their fantastic quality for himself.

"Music consists of order-relationships in time." The elements so ordered may be called "phases." Phases are perceived in two different ways: if a phase lasts a certain length of time we hear it as a duration; but if a phase-duration is shorter than approximately 1/16th of a second we no longer speak of "duration" but of "pitch" — the pitch, at first, of a very low note, which, as the phase-duration is progressively shortened, gradually "ascends," until, with phase-durations of approximately 1/16000th of a second, "exact pitch orientation gets lost in this time-

sphere." Since pitch and duration are merely two different aspects of duration, let us replace them, respectively, with the terms "micro-phase" and "macro-phase." What is achieved by this substitution? There is a broad hint in Eimert's article: "the fundamental unity of all acoustic material — the recognition that everything is identical." But, as Stockhausen himself pointed out at the beginning of his essay, "our sense-perception divides acoustically-perceptible phases into two groups" (my emphases). Will a mere change in terminology obliterate the distinction between "space" and "time" implied in the terms "pitch" and "duration"? The answer, for Stockhausen, is "yes"! Stockhausen and his colleagues of the "vanguard" may bombard us with pompous and self-righteous slogans about "mathematical basic research," "cybernetics," "information theory," "theory of games," "sound-quanta," "integral variation- and connection-models," "planned programmes," "conceptual systematization," "statistical methods," "objective psychological factors," "perceptual fields," etc., but it all boils down to an absolutely primitive and superstitious faith in the magical power of words, a witch doctor's confidence in the identity between the name of a thing and the thing itself. For two such dissimilar words as "pitch" and "duration" you have only to substitute two such similar words as "micro-phase" and "macro-phase," and you have an "observation" that "could form the basis of a new morphology of musical time."

This "new morphology"[1] provides a solution to the problem of the "serialization of durations" by providing a "scale of durations" analogous to the scale of pitches. Whole-note : half-note = 2:1 = "duration octave"; dotted half-note : half-note = 3:2 = "duration fifth"; etc. By deriving our twelve duration-proportions from the harmonic series, we arrive at an untempered "chromatic duration scale"; by deriving them from the 12th root of 2, we arrive at a tempered "chromatic duration scale." Since any proportion can be multiplied or divided by 2, the whole gamut of 88 "micro-phases" may be duplicated by an analogous gamut of "macro-phases." This possibility, and the conception of a tempered "chromatic duration scale," require that we consider 2:1 not just another proportion, but "the purest proportion," regardless of whether we are dealing with pitches or durations. "The dominating 2-relationship," according to Stockhausen, "seems to rest on a fundamental principle of our sense-perception." Stockhausen is generalizing from his perceptual experience, which appears to be absolutely unique. Surely, for everyone else, it is a matter of everyday observation that between our tolerance of deviations from 2:1 in pitch octaves and in "duration octaves" there is no relationship whatever. But when Stockhausen sinks his teeth into an analogy he clings to it with the tenacity of a bulldog. We quote the following bit of inimitable fantasy without comment:

> Our powers of discrimination impose limits; with relationships of approx. 15:16 we perceive durations as almost the same length. This interval 15:16 corresponds to the relationship which is decisive for the discrimination of 'duration' and 'pitch' [i.e. the threshold between "macro-phase" and "micro-phase," as explained above—G. P.]. The

1. Not so new! See Hugo Weisgall's article, "The Music of Henry Cowell" in The Musical Quarterly, October 1959, pp.487, 499.

same interval is also approached in the chromatic scale of pitches used up to now, where the 'semitone' (approx. 15/16) is defined as the smallest perceptible quantum.

We have concerned ourselves with only a small proportion of Stockhausen's lengthy essay — not more than a "major second," so to speak. We will not follow his construction of the details of his "new morphology," with its "duration formants," "duration intensities," "duration noise," etc.

Most of the remainder of this volume of Die Reihe is taken up with an article by Henri Pousseur, entitled "Outline for a Method." Pousseur has observed that "complete unpredictability" creates an effect of repetitiousness and thus cancels itself out when "seen from a higher level," and he has set himself the problem of achieving "complete unpredictability" that does not create this effect of repetitiousness. There are many pages of musical analysis, a term we may presumably use even for the "programmes" of compositions that are not yet written, since "it is no longer possible to make a distinction (or at least a fundamental one) between musical theory and practice, the intellectual and the sensory awareness of sound-phenomena." The musical material is divided into six "parameters"; each parameter may be characterized in five different ways; and each of these "supra-ordered degrees" again subdivided into "three subordinate possibilities." In this way we arrive at "equal mensural units for perceptible transformation." Pousseur indicates his preference for perceptible as opposed to imperceptible transformations by interlarding the description of his compositional method with quotations from Gestalt psychologists, but the precise relationship between the psychological portions and the musical portions of his article escaped me.

Volume III of Die Reihe also contains an article by John Cage.

If Die Reihe fails to deal constructively with certain contemporary musical questions, this is not a reason to assume that the questions themselves are invalid. The serialization of elements other than pitch, the significance for music theory of contemporary mathematical and scientific disciplines, the relationship between the variable and the fixed components of a musical composition — these are matters that a few serious musicians considered both as creative artists and as theorists many years before Die Reihe was even a gleam in Dr. Eimert's eye. They are "in the air," along with other, more urgent, problems — for example, the search for a cancer cure.

In its content, Volume III of Die Reihe is worthless, and in its manner, it is suspect. This is "the simple truth."

GEORGE PERLE

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THE LANGUAGE OF MUSIC. By Deryck Cooke. O. U. P., London, 1959, 289 pp., $4.80.

The author of this book did not have to hunt for a topic on which

to write. One could not even correctly say that he has a problem; the problem has him, he is in its grip, he simply cannot go on living with it in its present state, much less bear that an answer he knows to be wrong is widely broadcast and accepted as valid. The book has a sense of urgency rarely met with in purely theoretical writing. Questions of musical theory here become matters of human concern.

The problem is the ancient and formidable one of the significance of music. In earlier days it was the simple question: What is music? Today we prefer a more sophisticated wording: How should we understand that a man is moved by successive pitches? The view which carries most authority in our time — that music is pure construct, tones related to tones only, cleansed of all reference to things "outside," not-so-good-old Hanslick's "toenend bewegte Form" (form of sound in motion) — this view is rejected by the author, and rightly so, because it is not an answer. If tones relate to tones only, how can they ever relate to a man, move a man. Let this view hold, and the common musical experience becomes an incomprehensible miracle.

So eager is the author for an answer to counter these theories that he passionately grasps at the only alternative readily available, that music is the language of the emotions, not considering that it was the fiasco of this theory which provided the main impulse for the development of another approach. Therefore, here we witness the circumstantial and spectacular resurrection of a theoretical corpse, carried through mercilessly to its ultimate consequences. One admires the courage which does not permit shrinking away from the absurd if the sequence of the argument seems to lead to it.

> This book is an attempt to bring music back from the intellectual-aesthetic limbo in which it is now lost, and to reclaim it for humanity at large, by beginning the task of actually deciphering its language. It attempts to show that the conception of music as a language capable of expressing certain very definite things is not a romantic aberration, but has been the common unconscious assumption of composers for the past five-and-a-half centuries at least. It attempts to isolate the various means of expression available to the composer ... and to discover what emotional effects these procedures can produce; but more specifically, it tries to pinpoint the inherent emotional characters of the various notes of the major, minor, and chromatic scales, and of certain basic melodic patterns which have been used persistently throughout our musical history (p. XI).

The pinpointing begins with the "supremely satisfied, straightforwardly and contentedly joyful" major third, and the "supremely stern, straightforwardly and dignifiedly tragic" minor third (p. 64) and goes through all the twelve intervals, assigning definite emotional significances to each one and illustrating each copiously with musical examples. As an immediate result of this procedure a kind of emotional tone-dictionary is set up, from which the following are taken:

Minor Second:	Semitonal tension down to the tonic, in a minor context: spiritless anguish, context of finality.
Major Second:	As a passing note, emotionally neutral. As a whole tone tension down to the tonic in a major context, pleasurable longing.
Minor Sixth:	Semitonal tension down to the dominant, in a minor context: active anguish in a context of flux.
Major Seventh:	As a passing note, emotionally neutral. As a semitonal tension up to the tonic, violent longing, aspiration in a context of finality (p. 90).

(It is characteristic that in this dictionary the two pillars of the diatonic system, tonic and dominant, are both listed as "emotionally neutral," that is, in the context, meaningless.)

After the individual tones come certain basic melodic patterns. It is stated that in general:

> the expressive quality of rising pitch is above all an "outgoing" of emotion: depending on the tonal, rhythmic, and dynamic context, its effect can be active, assertive, affirmative, aggressive, striving, protesting, or aspiring. The expressive quality of falling pitch is of an "incoming" of emotion: depending on context, it can be relaxed, yielding, passive, assenting, welcoming, accepting, or enduring (p. 105).

More specifically, ascending 5-1-3 in major is "expressive of an outgoing emotion of joy ... pure and simple [p. 119, 124]," while the same in minor "expresses pure tragedy [p. 125]." Arched 5-3-1 in minor "conveys the feeling of a passionate outburst of painful emotion, which does not protest further, but falls back into acceptance — a flow and ebb of grief [p. 137/8]." The appoggiatura 6-5 in major is "a burst of pleasurable longing," in minor "a burst of anguish [p. 146]," and so on, through 15 such basic patterns. The opening of Parsifal, 1-3-5-6 in major, followed by 5-6-5 in minor, expresses "purity stained with sin and suffering [p. 155]." The "Tristan" chord is explained as follows:

> The F in the bass is the anguished minor sixth of that key (A); the D# is the "violently longing" major seventh of its dominant, E; the G# is the "violently longing" major seventh of A itself; and the B is the dominant of the dominant, having a stiffening, binding effect. So that the chord is compounded ... of anguish and violent longing in conflict ... (p. 191).

Of course, the source of these emotions is not in the tones; they are merely the vehicles. The source is in the composer, in whom "a certain complex of emotions must [seek] an outlet, a means of expression, of communication to others [p. 169]." Thus, music is first and

foremost a way of emotional communication:

> Composers have set out to express emotion ... listeners have felt it to be present in their music ... As the composer felt, so we may hear, and feel... The listener ... makes direct contact with the mind of a great artist, "interpreting" his expression of emotion in the same way that he will "interpret" an emotional letter from a friend: in both cases, mind meets mind ... (pp. 15, 20, 21).

The author is careful to stress that in this picture the role of the tones is not simply that of containers into which emotions are being poured. He does not admit a separation of emotional content and musical form; the two are inseparable like the electric current and the wire, or like a performance and the tape on which it is recorded. The whole process of musical communication involves two steps of transformation: first, the transformation of the original emotional experience into a sound pattern, then the re-transformation (in the listener's mind) of the sound pattern into a copy of the original emotional experience. Content is defined as "the form's potentiality for turning back into what it once was — emotional experience [p. 202]." The fundamental musical experience is defined as "the transformation of sound into emotion [p. 206]." An analysis of two major works, Mozart's G-minor Symphony and Vaughan Williams' Symphony No. 6, as emotional communications, concludes the book.

Logical consistency is a necessary, though not a sufficient condition for the acceptance of a theory. Factual evidence is equally essential. The amount of first-rate music proffered in support of each point of the author's argument is truly impressive; difficulty arises with the presentation of evidence to the contrary. If descending 5-3-1 in minor is said "to express an 'incoming' painful emotion ... acceptance of, or yielding to grief [p. 133]," and a Josquin chanson, "Incessantly I am forced to suffer torment," is quoted as an illustration, one can point to Josquin's Mass, Pange Lingua, where the same phrase appears in connection with the words tu solus altissimus, Jesu Christe. In this mass the "anguished" minor second is sung not only to Qui tollis and Crucifixus, but also to Kyrie, Et in terra pax, Patrem omnipotentem, Sanctus, and Hosanna. One could go on endlessly with such obvious and, in fact, trite observations. The practice of strophic song, which is as old as music itself, should undermine from the outset any attempt at a dictionary type coordination of tones and meanings. The statement that 5-4-3-2-1 in minor expresses "the despair connected with death [p. 133]" can be proved, e. g. by each stanza of the old song, "Reaper Death," where it is sung to the refrain "Beware, o lovely flower"; but when in the last stanza, with fear giving way to hope, the phrase rings equally true to the words "Rejoice, o lovely flower," the emotional dictionary collapses with a bang.

What ought to be argued, however, is not details and specific instances but the principle of the approach. For a dictionary to be feasible the relation of sign and thing signified must be of such a nature that the meaning of the sign can be detached from, and applied to, any

number of individual occurrences; in other words, a dictionary presupposes abstraction and generality of meanings, at least to a degree. The more the individual aspect of meaning prevails over the general, the more problematic a dictionary becomes. (This is the difficulty encountered in enterprises like physiognomics, graphology, dream interpretation, perhaps also medical science.) The signs of our word languages are class symbols; they refer to something which can be abstracted from, and which is common to, any number of individual instances, e.g. "horse," "green," "think," "fear." To assume for music an analogous generality of meanings, an analogous relation of signs and things signified, is simply to transfer the meaning-pattern of verbal language to tonal language. Nothing justifies this transfer; it has no sound basis either in fact or in logic, and it produces a completely distorted picture. The reason we should have a tonal language lies precisely in the difference of its meaning-pattern, in the potentiality of its basic symbols to assume an unpredictable infinity of meanings as they enter into and are absorbed by an individual context and become impregnated with its unique character. If I am told that 1-3-1 in minor expresses "brooding, an obsession with gloomy feelings, a trapped fear, or a sense of inescapable doom [p. 140]," and am then confronted with a page of beautiful melodic fragments, all containing that motion, the effect is definitely jarring, almost physically painful. The dictionary focusses my attention on that which is similar in all these 1-3-1 motions; the examples with all their inherent musical power pull me in the opposite direction, make me most forcefully aware of the uniqueness of each one, of that respect in which each single one is unlike any other. The minor thirds in Mozart's "Dies irae," in Chopin's Funeral March, in Schubert's "Wegweiser," musically speaking, have nothing whatsoever in common. To hear otherwise, to listen for what they have in common, is to listen anti-musically.

The root of all this trouble lies in the initial uncritical acceptance of the cliché, "music is the expression of emotion." First, there is the fallacy that whatever arouses an emotion must express an emotion. A spectacular mountain certainly arouses all sorts of emotions, yet nobody would contend that the mountain contains and expresses an emotion, or that the Creator expresses and communicates his emotion through the mountain. Second, there is the vagueness surrounding the term "emotion" and its use. As an example, in the catalogue of tonal meanings on p. 90 the augmented 4th is listed as expressing "devilish and inimical forces." Since force is not an emotion, what does the interval express? Does it express an emotion of the devil, or the emotion of the composer in the role of the devil, or my emotion when, not being the devil, I meet the devil? (Leonard H. Meyer in his Emotion and Meaning in Music avoided confusion by offering a definition of this term at the outset.) Finally, there is the pitfall created by the term "expression." Expression and emotional expression are not synonyms. A mathematical formula expresses a curve; Leibniz's monads express the universe; a particular style of handwriting expresses a character — and certainly not in the way a gesture expresses a feeling. We are confronted with two possibilities: music is either non-expressive or emotionally expressive. This is a trap. Music is precisely neither, but a third thing which it is our task to discover and clarify. Rather than let ourselves be caught in that trap, and subject music to the

straight jacket offered by the terms of those pseudo-alternatives, we should reverse the whole effort and test the legitimacy of the alternatives and their terms in the light of the musical experience.

But after all this, one must acknowledge that under the enormous theoretical superstructure of this book, and almost smothered by it, there runs a current of clean and sound musical sense. Again and again one feels like demolishing the superstructure in order to disentangle that current from its grip. In that way one might salvage a slim, engaging volume on the foundation of our tonal language in the interplay of tonal tensions, on the central role of a few basic terms in the development of tonal organisms, on the "vitality of particular form" as a criterion for musical quality (this in contradiction to the dictionary approach), exemplified by a perceptive description of Mozart's G-minor Symphony, which, though it does not probe very deep, will interest readers who are not familiar with the work on the morphology of tonal organisms done in recent years. The author himself, although he acknowledges his indebtedness to one worker in this field, Hans Keller, does not seem too familiar with these studies; otherwise he would not present an excuse for treating 1-3-5 and 1-2-3-4-5 as equivalent.

This reviewer noted only two errors in the whole book, a remarkable record of accuracy considering the scope of the materials encompassed: Don Giovanni sings his "Serenade" not to Elvira but to her maid, and Tamino's phrase quoted in Ex. 80 has a three-measure, not a two-measure structure.

VICTOR ZUCKERKANDL

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AN INTRODUCTION TO THE TECHNIQUE OF PALESTRINA. By H. K. Andrews. Novello and Company Ltd., London, 1958, 256 pp., $9.00.

Despite its modest title this book is much more than an ordinary introduction. Although limited to the ecclesiastical style of Palestrina, by the author's intention, it presents an unusually thorough study of that composer's technique. In the preface the author pays grateful tribute to the earlier researches of Knud Jeppesen and R. O. Morris and lists in the bibliography about twenty additional sources and studies in the field of 16th-century music. Considering the author's numerous references to fairly recent studies, it may seem strange that Arthur Tillman Merritt's Sixteenth-Century Polyphony (Cambridge: Harvard University Press, 1939) and Gustav Soderlund's Direct Approach to Counterpoint in 16th-Century Style (New York: Appleton-Century-Crofts, 1947) pass unnoticed. Can it be that these books have not yet found their way to the Oxford libraries and the attention of Mr. Andrews, lecturer in music at Oxford University?

The book begins with a chapter on "The Ecclesiastical Modes in Polyphony." Chapter II (about 20 pages) then presents an extended and lucid discussion of "Rhythm and Time Signatures." The remaining chapters deal with "The Rhythmic Melodic Line," "Vertical Interval Technique" (with attention to the interval-combinations recognized as essential, the normal and exceptional treatments of dissonance, and

principles of part-leading), the "Contrapuntal Techniques" of fugue, canon, and inversion, "Textures, Form, Structure," and "Word Setting."

The text is supported throughout by an unusually large number of musical illustrations. If its price seems high in proportion to the number of pages the prospective buyer can be well assured that the examples justify the price; indeed, the publisher is to be highly commended for going to the considerable expense of engraving 242 of these — some of which fill a page or more. Author and publisher deserve further praise for citing the volume and page number in the Breitkopf and Härtel edition of 1862-1907 where each quoted example may be found and for giving corresponding references to the "Roma" edition begun in 1947 and now in process of completion. In several cases where the two editions differ the author presents the variant readings for the purpose of comparison. A complete tabulation of the musical illustrations and a detailed subject-index are provided in the last 15 pages.

Much of the material is necessarily familiar to students of Palestrina's music and of earlier treatises on 16th-century style, but there is always room for a fresh restatement of facts when the material is well organized and presented in clear and readable English such as that which is at Mr. Andrews' command. The following excerpt from his discussion of "The Rhythmic Melodic Line" (p. 48) illustrates not only his descriptive style, but also the apt use of geometric design to demonstrate a point about melodic contour:

> Compound Leaps
>
> Sometimes two leaps in the same direction are found. In ascending passages of this kind the larger leap is generally taken first, followed by the smaller; is the characteristic shape of the curve rather than ; in downward progressions the shorter leap generally comes first, making the pattern rather than The same principle applies to leaps followed or preceded by steps in the same direction.

This statement is followed by a selection of musical examples. Included among them is a case of the admittedly rare use of the rising leap of a minor sixth followed by a major third in the same direction. This is but one of many evidences of the author's thoroughness in citing examples of unusual procedures as well as the more normal ones. It is noteworthy that, in the excerpt quoted above, as in many other cases where a generalization is made, Mr. Andrews qualifies the statement through the use of such words as "generally," "usually," "almost invariably," or "so far as I am aware." This is a wise precaution since it is scarcely possible for even the most painstaking scholar to investigate and remember every phrase of a composer's lifetime output.

From Mr. Andrews' discussion, "Rhythmic Considerations" (pp. 49-50), we extract the following paragraph, the full discussion, un-

fortunately, being too long to quote:

> The treatment of the various note values, especially in the case of the shorter notes (crotchets and quavers), varies to a considerable degree with the time signatures employed. The difficult problems arising out of the 'proportional' time signatures of the sixteenth century have been mooted in the note at the end of Chapter II. It was there shown how uncertain the real meanings of these signs must remain. In practice, however, various factors relevant to the matter under consideration emerge quite clearly. The chief of these seems to be the value of the 'harmonic pulse' (i.e. the shortest note values on which changes of interval combination from the vertical point of view occur) in the measure, under the various time signatures used. This, in turn, is largely dependent upon the actual temporal value of the notes in question.

This paragraph is followed by detailed statements dealing with specific note values occurring in music with different time signatures. In later paragraphs of the same chapter attention is directed to "Special Treatments of the Bass," a phase of 16th-century polyphony about which little or nothing is said in many treatises.

Footnotes in which the author evaluates the conclusions of other writers are often as illuminating as the body of the text. One of these (p. 63), concerning the use of the intervals of the augmented fifth and the diminished fourth between two of the upper parts, quotes a statement from Jeppesen to the effect that the use of these intervals makes possible the chord called in modern times "the augmented triad in the first inversion." Andrews then discusses specific cases cited by Jeppesen and takes the position that the use of that chord as a full consonance "is not nearly so firmly established as Jeppesen suggests." After pointing out that some of these cases can be explained through particular manipulations of unessential notes, Andrews continues: "Even more disquieting is the fact that many of the instances which Jeppesen cites depend on the interpretation of Musica ficta." Discussing one of these citations, Andrews compares the two principal editions and points out that with the removal from the newer edition of a questionable $B^{\flat}$ found in the earlier edition the interval of the diminished fourth disappears, and with it the alleged augmented triad. He then concludes: "R. O. Morris ('Contrapuntal Technique', p. 43) was probably right in stressing that the various augmented and diminished intervals available by means of Musica ficta alterations ... were 'not in the style of the period'."

Andrews himself seems to be fond of $B^{\flat}$, C#, F#, and G#, and sometimes inserts them without comment in places where they do not appear in the earlier complete edition of Palestrina's works. In view of the conflicting opinions of reputable editors concerning the application of Musica ficta in particular cases, many students (including the present reviewer) would have been glad to find a fuller discussion of the problems of editing created by the all-too-obscure "rules" for the insertion of accidentals. For example, is the absence of $B^{\flat}$ (especially as a passing-note) in the printed version of many a falling melodic line to be considered as evidence that Palestrina wanted $B^{\natural}$ to be performed, or was the use of $B^{\flat}$ so prevalent that neither Palestrina nor his editors considered it necessary to provide a clue? Furthermore, although it

is quite commonly understood that C, F, and G were chromatically raised when used as resolutions of suspensions in formal cadences, does it follow that these notes were normally raised in ascending scale passages or when they were immediately preceded and followed by the next higher note of the mode, quite apart from any suspension requiring a conventional resolution? Perhaps it may be impossible or imprudent to be more specific than the author is in the summary given on pp. 15-16 and in the brief references on other pages listed in the index under "Musica ficta," but if further elucidation of this matter is available, the reviewer would have been gratified to find it within the covers of this book.

Andrews' chapter on "Word Setting" provides more information than I have found in any similar treatment elsewhere. A feature of special value is the comparison of different word-distributions in particular phrases as printed in the two principal editions. In some of these cases the author ventures an opinion as to which is preferable.

The Andrews work, unlike Soderlund's Direct Approach, is not arranged as a series of lessons for classroom instruction; however, it is a book which any teacher ought to study both to check the accuracy of his own knowledge and also to benefit from the additional light it sheds on the many phases of technique which are less thoroughly examined elsewhere. For the busy teacher a combination of Soderlund for course assignments and Andrews for authoritative reference would seem to be an ideal combination. In the considered opinion of this reviewer Andrews' The Technique of Palestrina should occupy a place of honor on the desk of every teacher and serious student in this field.

H. LEROY BAUMGARTNER

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MODAL COUNTERPOINT IN THE STYLE OF THE SIXTEENTH CENTURY — Outline by Ernst Krenek. Boosey and Hawkes, New York, 1959, 21 pp., $1.25.

This volume, about the size and heft of a Boston Symphony Program-book, opens with a Preface in which we read that its purpose is "to present subject matter in concentrated form for the use of teachers and students who can devote only a limited amount of time to the study of modal counterpoint," that "the material can easily be covered in a three-unit, one-semester course," and that "special emphasis is placed on the development of the student's sense for freely articulated melody (hence the absence of bar lines)."

Although the word "rhythm" is not mentioned anywhere in the Preface, we might infer that it is one of Krenek's concerns; but any such hopes are dashed in the "Introductory Remarks" that follow, where we read that "Sixteenth century counterpoint is based on rigid discrimination of consonances and dissonances and characterized by extremely careful and fully rationalized control of the use of dissonances. Therein lies the particular pedagogic value of studying the contrapuntal technique of the sixteenth century." Rhythm, the glory of that music, is mentioned nowhere on this page either, and from there we plunge into a treatise so obsessed with refinements in the handling of dissonance

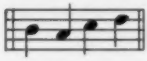
that there is no room for rhythm, nor indeed for that "freely articulated melody" the study of which is vital to us today. Even a severe minimum of text, often in the style of telegraphed marching-orders, at times cryptic or even lacking, does not seem to save space for a proper treatment of melody and rhythm.

What is given in the way of technical information is sometimes based on rare cases, or just downright wrong. A footnote claims indebtedness to Jeppesen and Merritt; would that this indebtedness had consisted in getting more correct facts from the books of these men! Here are some specific annoyances:

p. 1 — In Hypophrygian, Krenek's "tone of secondary emphasis" (presumably identical with what has been called dominant, tenor, reciting-note, confinalis, socialis, suspense-tone, note of tension) is given as G, whereas Jeppesen, Merritt, Morris, Soderlund, and Andrews give A. They call G "mediant".

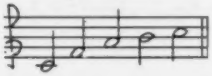
p. 2 — no definition of leading-tone is given; the word simply appears in discussing musica ficta where the author mentions the function of "C-sharp as raised leading tone in approaching the final of Dorian." This is all well and good, but on p. 4, under "Cadences," the student reads: "Approach the final of the mode stepwise from the upper or lower leading tones. Both leading tones should be approached stepwise." Evidently we now are to assume <u>two</u> leading-tones. Thus, when we read, four sentences later, that "the leading tone in Phrygian is never raised" we ask to which one of the two reference is made.

More confusion follows. I quote: "2b) Metric conditions. Alternation of potentially accented and unaccented beats. Every other half note beat is potentially accented." The meaning of "potentially" escapes this reviewer. However, this is of little consequence when we consider that for the next five pages the student has only this directive, and that therefore he assumes that the alternation of accented and unaccented beats concerns half-notes only. Can you blame him for becoming confused when a half-page later, he reads that "In quarter notes [there occur] upward skips from unaccented beats only" (according to Krenek's rule therefore, from weak <u>half-note</u> beats) and then is confronted by this example:



which is labelled "right"? If, as we have been told, "All examples begin with potentially accented beats," then Krenek should have labelled this "wrong." Actually, of course, it is correct, but the confusion arises from the fact that the student has not yet been informed that there can also be accented and unaccented quarter-notes. He finally learns this four pages later.

Krenek labels the following "right":



Relevant to this Morris says: "Two successive leaps (if taken at all) should be preceded and followed by movement (preferably conjunct) in the opposite direction of the leaps [<u>1</u>, 29]." Soderlund would call

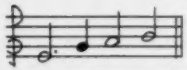
Krenek's "right" example "exceptional usage [2, 14]."

As for the following, it is about as enlightening as an unedited Eisenhower press-conference:

"In all rhythmic values

Skips in ascending portions of the melody must not be preceded, in descending portions nor be followed by stepwise motion in the same direction."

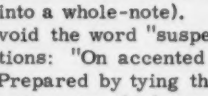
In Ex. 4, which follows this immediately, there occurs (labelled "right"):



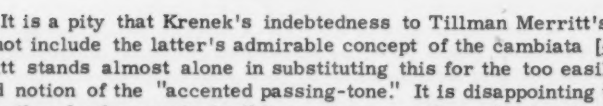
I have never seen this in 16th-century vocal writing. Jeppesen [3, 142] forbids it. Soderlund [2, 60] does quote a "rarely found" instance from Morley. As we have seen, Krenek himself seems to have declared against these upward skips from accented beats. Nevertheless another occurs without comment in the middle of his Ex. 6.

To proceed, the first two "complete melodies" in Ex. 9 have unidiomatic cadences, and the last has lost a beat (easily supplied by making the penultimate C into a whole-note).

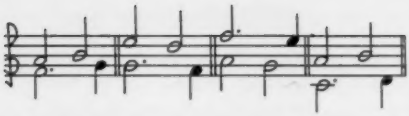
Why does Krenek avoid the word "suspension"? And why these curiously backward directions: "On accented beats: Half notes only, if treated as follows: (1) Prepared by tying the dissonating tone to the preceding half note or longer note which must be consonant (2) Resolved stepwise downward into an imperfect consonance on the following half beat..."[?] It seems to this reviewer that something very important happens between steps (1) and (2) in the accompanying voice. It is only by inference that the student is aware that there is another voice involved. Luckily this time the notated examples are good, and save the situation. But the first bar of Ex. 13 ("ornamental resolution") is so rare that one would do best to avoid it. Certainly it should not be recommended as it is there:



It is a pity that Krenek's indebtedness to Tillman Merritt's book does not include the latter's admirable concept of the cambiata [4, 74]. Merritt stands almost alone in substituting this for the too easily accepted notion of the "accented passing-tone." It is disappointing to see yet another book perpetuate this erroneous notion. As for the "anticipated dissonance" on p. 8 of Krenek's book, Krenek only knows where that comes from. I quote his Ex. 16 (+ means "anticipated dissonance"):



The first of these bars illustrates Merritt's cambiata. The others represent innovations in 16th-century counterpoint, as does the "delayed parallel motion" of Ex. 17:



The first, third, and fourth bars here are only right if their second half-notes are made passing half-notes, moving by step to a consonance in the next bar. (See Jeppesen's examples [3, 143])

How can one best organize a semester of study of modal counterpoint? One could begin by singing the Lassus Cantiones Duarum Vocum from scores without bar-lines. The students could then experiment with non-metrical barrings, different for each voice, with melodic analysis and discussion of agogic, tonic, and word-accent. Finally, the implications of the important metrical basis would come under discussion.

It would seem better to place emphasis on these matters first, rather than on the handling of dissonance. In the 31 bars of Oculus non vidit one finds only 21 passing quarters, 3 alternating eighths, 2 cambiata eights (or "passing" if you wish), and 3 suspensions. The remaining notes are consonant. In the dozen Cantiones taken together there are only four 4-3 suspensions, only one changing-note group (Krenek's "cambiata") — which contains no dissonance — and all cadences are of course idiomatic. Much to which Krenek devotes space does not occur in these pieces. There is no augmentation, diminution, passing half-note, "anticipated dissonance," "delayed parallel motion," double counterpoint in the 10th (although some fine instances of double counterpoint in the 12th, a technique which Krenek leaves to the student to figure out), no "consonant 4ths" and no quarter-notes dissonating on unaccented beats. But there are glorious irregular triple and duple articulations of rhythm out-of-phase between the voices, and any number of skillfully undermined (hocketted) subordinate harmonic cadences.

Instead of illustrating from the old masters, Krenek has written every note in the book himself, I assume. Out of some 29 cadences, 13 are wrong or in some way peculiar. Freedom from bar-lines is fine if one keeps track of metrical accents. But the worst happens: the entire latter half of his "Complete Two Part Motet" gets out of step somewhere, with the result that nightmarish suspensions occur on unaccented beats, etc. There is no real rhythmic analysis anywhere in the book. To be sure there are some suggestions, e.g.: "No more than two-thirds of the potentially accented beats should be articulated," or "The notes on the remaining potentially accented beats should be tied over from the preceding beats," or "The half-note is the basic unit," and "Have about 75% of the melody in half notes and larger notes...." One of Krenek's examples is a "Complete Three-Part Setting," freely imitative, without text, in which the soprano drones on for the equivalent of ten bars, chiefly descending in dull chains of syncopations — "Music that never was on sea or land" Morris would call it. This is given as a model for students.

The book ends with a brief explanation of the Five Species, an anachronism which seems completely superfluous.

FRANCIS JUDD COOKE

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THE RATIONAL AND SOCIAL FOUNDATIONS OF MUSIC. By Max Weber. Translated and edited by Don Martindale, Johannes Riedel, and Gertrude Neuwirth. Southern Illinois University Press, Carbondale, Ill., 1958, 148pp., $5.75.

Although more than a quarter of a century has passed since this essay was first published in Munich (1921), it is just as timely today as it was then. It has been reprinted in German several times (for example, as an appendix to Weber's Wirtschaft und Gesellschaft), but this is the first time that the pioneering treatise has appeared in an English translation.

The editors have done a careful job of translating and editing a rather difficult essay. Besides dividing the work into meaningful chapters and sub-sections to facilitate understanding, they have done an extensive job of annotating. A special boon to the reader who is not well acquainted with Weber's basic ideas is the rather extensive introduction (42 pp.) prepared by the translators. Many of Weber's basic sociological theories are set forth there along with further exposition and interpretation of the main essay. The reader would do well to acquaint himself with this before attempting the basic ideas on the sociology of music.

Musiocologists and music theorists ought to find this fascinating reading. Whether or not one agrees with Weber's theories and arguments he will find them intriguing. There is a basic theme which runs through Weber's writings: that in the Western world there is a movement toward rationalization among all social institutions. The arguments are well presented and his evidence cannot be dismissed lightly. Applying the basic theme to music, we find evidence to support the principle that Western music has rational properties which are produced by the social development of Occidental institutions. "Rational" is interpreted to mean "reasonable" or "conducted in terms of logical or scientific principles." The arts are no exception to the basic drive toward rationality. We see it in the calculable rules of architecture as well as in the rational use of line and perspective in Western painting. The same principle applied to music gives us a rational analysis of tone-systems, scales, chords, systems of notation, and the development of instruments. Weber points out, for example, the tension that exists between rational and expressive requests for harmonic and melodic elements. On the one hand, we are driven to attain a maximum of

logical order, on the other a free, creative, and affective expression. Likewise, we see how the rational process is furthered in the production and tuning of musical instruments. With the rise of instrumental music, the division of the octave into twelve equal distances (twelve equivalent semitones) becomes a necessity. Or as science banishes the mysteries of magic, the rational thinking present in man's musical culture attempts to transform even the highest of musical expressions into a mathematical equation. These are only a few of the ideas presented in Weber's brief but careful analysis. Many comparisons are given to support the thesis: Oriental vs. Occidental, pre-diatonic vs. Western scale-system. These show that Western culture is distinguished from all others by its devotion to the rational principle.

The study should be of interest to sociologists and musicians alike, although it will probably be most accessible to the music theorist. As a scholarly work it illustrates the broadness of Weber's interests and the full range of application of his sociological theories, providing ample evidence that he is one of the leading social scientists of our time.

ROBERT W. LUNDIN

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THE ART AND THEORY OF MUSIC. By Frederick Woodhouse. Pitman Publishing Corporation, New York, Toronto, and London, 1958, 115 pp., $4.50.

The old Novello Primer, Sonata Form, by W. H. Hadow was my introduction to English theoretical writing — about a decade ago. Through the succeeding years the delight and enthusiasm kindled by Hadow have been periodically renewed by such works as Arnold's The Art of Accompaniment from a Thoroughbass, Andrews' The Technique of Palestrina, and Collinson's Orchestration for the Theatre (this last treating one of the aspects of musical craft designated as "theory" in music school catalogues). These are strong books — strong in style as well as content. They illuminate the art of music. Their attention to detail, accuracy, objectivity, sequence, and completeness bespeak the scholar's temperament on every page.

It is precisely in these respects that The Art and Theory of Music is disappointing. The preface states that the purposes of the book are "to cover the basic requirements of the General Certificate of Education and other standard examinations" (in Great Britain), also to "meet the requirements of the vast public which... wants to know something of how music is written and how what is written is to be interpreted." To accomplish these ends the author has written a book consisting of one hundred pages of text plus fifteen pages of appendices (a short outline of music history and a glossary of musical terms). The text is divided into sixteen chapters (an average of about six pages to a chapter, although one chapter consists of slightly more than one page, and several others of only three or four pages). The complete table of contents follows:

I. Notation
II. Time (rhythm)
III. Sharps, Flats, Accidentals and Key Signatures
IV. Note Relations: Intervals
V. Scales and Modes
VI. Harmony and Counterpoint: Figured Bass
VII. Signs for Ornaments, Abbreviations, etc.
VIII. Tonic Sol-fa
IX. On Writing Music
X. Form in Music
XI. Fugue
XII. The Orchestra
XIII. The Full Score
XIV. Listening: What does It Mean?
XV. Opera and Oratorio
XVI. Musicians in Schools

Considering the fact that volumes have been written on almost every chapter title listed above, it is evident that the elements of detail and completeness are of no concern to the author. This would not in itself constitute a defect in a book of this sort were there not such an obvious absence of conviction. On p. 20 we find the incredible statement: "All this is as tiresome to learn as it is to put down in writing. It gets one no nearer to the appreciation of Brahms, Berlioz or Britten and it is unlikely that any of them ever consciously wrote in 'intervals' — but for examination purposes we have to suppose they did." At this point the suspicion raised by the prefatorial statement of purpose is confirmed; here is another book designed, not to clarify and crystallize, not to get at the heart of musical matters, but to nibble at the periphery of music, to "satisfy requirements."

Machlis, Boyden, Boatwright, Liepmann, and other contemporary authors of books for the musical neophyte have demonstrated the feasibility of writing objectively about music. It is to their credit that a great deal of obfuscation has been eliminated from basic music textbooks. In the light of modern developments in psychology and semantics this is as it should be. But here again The Art and Theory of Music is wanting. On p. 20, for example, we find: "Perfect concords... give an effect of solidity and completion. Imperfect concords... although harmonious, have a tentative effect. All other intervals are discordant, some giving the listener an uncomfortable feeling." Such use of undefinable terms, constituting a regression to the logical naïveté and nonoperational semantics of earlier theorists, is something less than even the musical amateur and present-day teacher candidate expect.[1]

That the word "errata" exists testifies to the fact that they are to be expected. Unfortunately, many of the errata in The Art and Theory of Music are of a particularly serious type. On p. 4, where the use of the dot after a note is explained, the musical illustration omits the dot.

1. Cf.: "The basic characteristics of dissonances are suggested by their name, which expresses the fact that they sound bad." (C.P.E. Bach. Essay on the True Art of Playing Keyboard Instruments, translated and edited by William J. Mitchell, New York: W.W. Norton and Co., 1949, p. 191.)

To the conscientious reader, struggling to relate text to example, this is as frustrating as if in a beginning arithmetic text he should come across the statement: 1 + 1/2 = 1. On p. 5 a similar erratum appears. The tenor clef is shown as locating middle C in the fourth space, rather than on the fourth line. Again, on p. 18, the word "octave" is substituted for the word "tonic," presenting the reader with an insoluble problem of meaning.

The author's use of expressions like "as will be explained later on" (p. 17), "this will become more apparent as the subject is pursued" (p. 17) and "as will be stressed in Chapter XIV" (p. 58) hint at the general weakness in organization that is evident throughout the book. The term "natural scale," introduced on p. 11, is not explained until p. 21; cadences are not defined and illustrated until after the chapter on modulation; and the expression, "a key nearly related," which is introduced on p. 11, is never defined.

Occasionally the author's resort to classroom gadgetry to develop an issue is questionable. A case in point occurs on p. 12 where, in an examination of the accidentals in "The Agincourt Song," an explanation of modal practice is given in terms of tonal theory that to the reviewer seems historically unsound. A similar instance appears on p. 17 where, in attempting to elaborate the numerical characteristics of intervals, Mr. Woodhouse, for a full strenuous page, belabors mightily a delusionary mathematical windmill.

This book is not lacking in lucid and instructive passages. Chapter X, "Form in Music," is perhaps the most acceptable section of the book. The treatment of the history of the orchestra in Chapter XII (while concerned with neither theory nor art) is an excellent digest. It is regrettable that the level of excellence manifested in these portions of The Art and Theory of Music is seldom achieved in the work as a whole.

WILLIAM PELZ

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LISTENER'S GUIDE TO MUSICAL UNDERSTANDING. By Leon Dallin. Wm. C. Brown, Dubuque, Iowa, 1959, 306 pp., $3.50. Workbook $2.25.

In its foreword this book states that its purpose is to "strive to develop a source of cultural enrichment and pleasure which endures beyond the classroom [p. xiv]." This is to be accomplished by stressing listening experiences and general principles rather than by concentrating on statistics and details. Its objective, thus, is similar to that of the many other textbooks and manuals recently published which are concerned with explaining music to the listener. Likewise, its list of topics covers familiar ground. These topics include:

> The Materials of Music, including sound, mediums, elements, texture;
>
> The Forms of Music, including small and large homophonic forms, variation forms, multimovement forms, free and miscellaneous forms, program music, dramatic music, song forms, choral forms, and religious music;

The Styles of Music, including survey of periods and styles, modern music, folk music, jazz, and popular music.

Each of the categories or types is illustrated by one or more examples chosen from music literature; the listening list covers a wide range of forms and styles. There is a glossary of musical terms, an index of compositions discussed, a chronology chart of composers referred to in the text. The lack of a general index is a serious limitation to the use of this book as a study tool.

For the readers of this journal, the author's treatment of concepts and techniques of music theory should be of primary interest. Items of music theory, such as chord-types, key, mode, melody, meter, rhythm, etc. are described and illustrated; as a rule, the explanations are clear and the data reasonably accurate. Yet, the tendency to categorize, based upon what seems to be an oversimplified view of style and technique, prevents the data from being understood in a comprehensive and balanced perspective, either stylistically or historically. To illustrate this point, several quotations from the text are given below:

> The possibility of confusion between the primary and secondary accents and consequently between three-beat and six-beat measures is apparent.
> It is reassuring to note that appreciation is not seriously impaired by such minor discrepancies in perception and that professional musicians are not infallible in this regard (p. 87).

The second movement of Mozart's Symphony in G minor is cited as a case in which such confusion may arise. Granted that hearing the six-beat measure is not possible without some concentration, still it is contrary to the musical sense of the piece to overlook or minimize its broad metric groupings which play a basic role in the phrasing, musical movement, and structure.

> Stresses in his (Palestrina's) music stem not from emphasis on certain uniform patterns but from ascending leaps in the lines, from prolongation of selected pitches and from relationships between the voices (p. 91).

To complete the description of rhythmic movement in Palestrina's music the author should have pointed out that the underlying beat is the tactus and that groupings of two and three beats do organize the flow on a less rigidly regular basis than will be found in baroque or classic music.

> In the late 18th century melodies typically were... lyric, flowing, and song-like..., more akin to folk songs. The melodies of Haydn, Mozart, and their contemporaries fall in this category (p. 101).

This is a drastic oversimplification; it fails to recognize the tremendous range of melodic style and the bold contrasts projected by Viennese classic composers.

> Modern melodies depart radically from traditional means but their objectives are the same as always (p. 102).

Again we have an oversimplification. The author modifies this statement subsequently but from a pedagogic point of view. It is dangerous to provide the student with such an idea. He may either become confused when he hears many "modern" melodies which are quite similar to "traditional" types or he may stop listening for the character of the melody in order to remain comfortable within this generalization.

> Tonality is that phenomenon which causes musical sounds to gravitate to a single focal point.... There is no obvious reason for the supremacy of one tone and the subservience of others, but this orientation around a central pitch occurs spontaneously (p. 110).

Certainly we know more about tonality than is implied by the description "spontaneous orientation." The harmonic series, harmonic functions, especially those based upon tritone action, and rhetorical emphasis — all these are demonstrable processes with respect to the definition of a tonal center. Moreover, they can be grasped directly and vividly by the listener if presented simply and clearly. Indeed, this perception of the interaction of tones through function gives the listener a view into the inner workings of musical sound which no descriptions and generalizations can match.

> [on fugue subjects and answers] The answer is not an exact repetition of the subject. It is on different pitches, and sometimes the shape is altered slightly, but for listening purposes the subject and answer may be considered the same and are so regarded in the discussion (p. 168).

In a fugue, subject and answer represent a polarity of the tonic and dominant aspects of the central tonality. This reflects the centuries-long orientation of mode around authentic and plagal gamuts. Aurally this is quite simple to demonstrate even to a layman and shows that in their essential harmonic meaning subject and answer are certainly not the same.

The organization and emphasis of the book leans heavily toward information, biographical, historical, and descriptive. Stylistic analysis and esthetic principles receive much less attention. Thus, in the two pages given to The Messiah of Handel we have a listing of the titles of the 53 numbers of the work, following which there is a paragraph on the cuts customarily taken in performance and a paragraph on several items of historical interest. For Berlioz' Symphonie Fantastique we have a page and a half giving the scenario in detail, a brief categorization of the forms of each movement, and a description of the treatment of the idée fixe. There is no mention of Berlioz' orchestration and his strikingly asymmetrical phrase-structure, qualities which have immediate meaning and appeal to the listener. In the section on dramatic music the following is the complete reference to Mozart: "The preeminence of Mozart (1756-1791) in this style is acknowledged (p. 202)."

On the other hand, four pages (pp. 210-214) are needed to discuss incidental music; these include a detailed description of the rehearsal and recording routines for producing motion picture music.

A workbook including objective data examinations, listening projects, and essay problems accompanies this text. The editing of the text could have been much more thorough. There are many typographical errors.

LEONARD RATNER

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LETTERS TO THE EDITOR

Mr. Lewin's article, "Intervallic Relations between Notes" (November 1959 issue of your journal), raises a number of questions as to its musical relevance. It would have been useful, for example, had Mr. Lewin indicated whether any significant use of this notion had been made by any of the originators of the twelve-tone technique. He might also have indicated in what way his notion might prove useful in present day composition. As the paper stands, it seems musically trivial.

I would like to add that the use of such language as Mr. Lewin affects (like killing a gnat with a pile-driver) seems intended to intimidate the reader rather than to define or elucidate a problem. There is enough of this sort of thing in the efforts of our Central European friends -- especially in Die Reihe and the Gravesano Blatter. I, for one, deplore its appearance on this side of the Atlantic.

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ANNOUNCEMENT

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